

### **3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES**

This chapter describes the existing environment and environmental consequences on the lands of Tims Ford Reservoir potentially affected by the proposed action and the varying alternatives. These lands are separated into parcels according to their existing land use and/or the presence of sensitive resources. Parcel descriptions are found in the Tims Ford Land Management and Disposition Plan.

#### **3.1 GROUNDWATER AND GEOLOGY**

The potential for land allocations to alter groundwater levels, flow rates, and directions and therefore affect water supply was raised as an issue during the scoping period. In this section, the geologic setting influencing groundwater will be reviewed. This will be followed by an assessment of the potential effects of each alternative on groundwater.

##### **3.1.1 AFFECTED ENVIRONMENT**

The Tims Ford Project area is located on the boundary between the Highland Rim and Central (Nashville) Basin sections of the Interior Low Plateaus Physiographic Province. Each section is characterized by landform and geology. The Highland Rim is a nearly flat to gently rolling area at higher elevations than the Central Basin that is underlain by Mississippian age rocks. Much of Tims Ford Reservoir is in the Highland Rim. However, the lower ends of the reservoir are on the distinctive escarpment separating the Highland Rim and Central Basin. This area is notched and dissected by streams. Hence, the Central Basin is characterized by many knobs and hills. The Central Basin is primarily underlain by Ordovician limestones and occurs where the Elk River and its tributaries have eroded the overlying Mississippian rocks of the Highland Rim.

The northwestern part of the project area is occupied by a spur of the Highland Rim. This and other areas of the Highland Rim are capped by the St. Louis limestone or Warsaw formation at higher elevations. However, these rocks are generally only observed in weathered phases (Theis, 1936). The predominant cap-rock of the Highland Rim in this area is the cherty Fort Payne formation. In fact, the uppermost bedrock unit underlying all parcels within the project area is primarily the Fort Payne formation. Only a few scattered remnants of St. Louis limestone or the Warsaw formation occur within any of the parcels. The Fort Payne formation is underlain by the Chattanooga Shale which can be observed as thin layers in outcrops. Beneath the Chattanooga Shale several types of upper Ordovician rocks can be found (youngest to oldest): the Brassfield limestone, Sequatchie formation, Fernvale limestone, Leipers limestone, Catheys formation, Inman formation, and Bigby-Cannon limestone (Hardeman, 1966). The Bigby limestone is often located near the drainage level of the Elk River.

Deposits of gravel, sand, and silt are found in the floodplains and channels of Elk River and its tributaries. These deposits can range in thickness of a fraction of a foot to 33 feet. In some locations, terrace deposits, remnants of floodplain deposits from past erosional cycles, are draped over bedrock up to 190 feet above modern floodplains (Hart, 1985).

The principal aquifers of this region are limestone aquifers in rocks of Mississippian age. Precipitation is the primary source of recharge in the project area. Most of the precipitation becomes overland runoff to streams, but some percolates downward through soil to the underlying bedrock. Some water is stored in and also moves through the soil. In the consolidated rocks, however, most of the water moves through and is discharged from secondary openings such as joints, fractures, bedding planes, and solution openings. As a result, groundwater discharge from springs and seeps is common. The communities of Winchester, Cowan, and Estill Springs have historically relied on springs for their municipal supplies (Smith, 1962).

Within the Highland Rim districts of the study area, chert and limestone beds of the Fort Payne Formation are the principal aquifers. However, other aquifers also occur in the area and are composed mostly of chert left from the weathering of the Fort Payne Formation. Where thick and saturated, this chert rubble constitutes a productive local aquifer and can store large quantities of water that subsequently percolates slowly downward to recharge aquifers in the underlying consolidated rock.

Carbonate rocks of Devonian, Silurian, and Ordovician age, which are primarily limestone with some dolomite, are good aquifers in the Central Basin. The Ordovician rocks lie beneath Silurian, Devonian, and younger rocks on the perimeter of the areas. The carbonate-rock aquifers consist of almost pure limestone and minor dolomite and are interlaced with confining units of shale and shaley limestone. Where these aquifers occur at depth, they are usually separated from the Mississippian aquifers by a confining unit of Upper Devonian shale (e.g., Chattanooga Shale).

The occurrence and movement of groundwater in the limestone and dolomite aquifers in Devonian, Silurian, and Ordovician rocks are much like those in the Mississippian aquifers. However, dissolution is less advanced in these aquifers, and solution features such as caves, springs, and sinkholes are fewer than in the Mississippian aquifers. Groundwater in the limestone and dolomite aquifers is almost exclusively stored in and moves through solution openings. The distribution of solution openings is complex and difficult to map, but most openings are in the zone of dynamic freshwater circulation between land surface and depths approaching 197 to 394 feet below land surface.

At certain locations, especially in areas possessing a combination of high rock solubility and well-developed secondary porosity, bedrock fractures have been enlarged by dissolution, and karst features (e.g., caves, sinkholes, seeps, and springs) exist. At a local scale, accurate prediction of groundwater flow rates and directions for individual parcels is impossible due to the complexity of fracture drainage networks and the present lack of data. However, due to the topographic positions of parcels considered in the project lands, it is evident that the vast majority of groundwater underlying parcel sites ultimately discharges directly into the Tims Ford Reservoir or indirectly via tributaries.

Given the karst geology of the area, there are likely groundwater contamination problems within the Tims Ford area due to underground storage tanks, faulty septic systems, and industrial releases. Upstream of the reservoir, there has been past contamination of groundwater by the Arnold Engineering Development Center on Woods Reservoir. Neither TVA nor TDEC is aware of any groundwater problems from existing development in the area.

### **3.1.2 ENVIRONMENTAL CONSEQUENCES**

Potential impacts to groundwater in the vicinity of parcel sites may be generally divided into the following categories: (1) groundwater and surface water quality, and (2) groundwater levels, flow rates, and subsidence. Alteration of groundwater levels, flow rates, and directions can potentially impact domestic wells, streams, and springs used for water supplies. Although rare, changes of this type can produce subsidence or sinkhole collapse in areas underlain by carbonate rocks. In a broad sense, intensive development of project lands may increase the likelihood of contaminant releases to groundwater and surface water from ground-disturbing activities such as construction. While contaminant releases to groundwater are most likely to stem from industrial operations and wastewater treatment facilities, residential septic tank systems can result in groundwater quality impacts. Problems with groundwater quality could impact surface water if the septic tank systems are improperly designed, operated, or maintained. For instance, interpretation of color infrared photography by TVA (Springston, 1994) suggested that 13 percent of 371 septic systems visible from photographs of the Tims Ford Reservoir shoreline area exhibited distinctive moisture patterns while 17 percent of the 371 septic tanks visible indicated suspicious moisture patterns. Distinctive moisture patterns indicate a high probability of system failures or systems operating at capacity. Suspicious moisture patterns do not specifically indicate system failures; however the condition places the systems in a suspect category. Based on this photo interpretation, 13 percent of the interpreted sites were ranked as having a high probability of failure, and the results indicate that the impact to water quality of Tims Ford Reservoir from septic tank failure is marginal at best. The results do not warrant monitoring water quality along the shoreline. It is possible

that groundwater quality has been impacted by faulty septic tank systems in the area. Additional development would have to be carefully undertaken to avoid further groundwater impacts.

At upland parcel locations, soils may be sufficiently thick to afford some amount of groundwater protection from contaminants that might result from human activities (e.g., industrial releases, fuel spills, faulty septic tank systems). Where bedrock aquifers are overlain by thin soils and receive relatively direct recharge, these natural systems may not be able to handle such a contamination. This is especially true along the steep slopes bounding portions of Tims Ford Reservoir. However, the screening model used to select potential lands for future development eliminated lands with slopes greater than 15 percent from consideration, and current Division of Groundwater Protection, TDEC (GWP) rules for septic tank systems require at least 31 inches of soil.

Some quantity of a hypothetical contaminant entering the bedrock groundwater system adjacent to the reservoir might eventually be discharged to the reservoir. Potential contaminants of a transient nature might include fuels, oils, solvents used for operation and maintenance of construction vehicles and equipment, and spills of herbicides or pesticides. Potential contaminants that are generally found in the area include bacterial and household contaminants from improperly designed or operated wastewater treatment systems or septic tanks and undefined industrial releases.

The likelihood of occurrence of groundwater impacts can be minimized by careful monitoring, handling, and disposal of potential contaminants. Increased development and associated construction in the project area might also impact groundwater quality through changes in nutrient budgets, increased organic loadings, changes in mineral solute loads, pH changes, and dissolved oxygen (DO) changes. Because these types of impacts are usually associated with erosion from construction activities, their likelihood of occurrence increases with the intensity of development undertaken in the project area. Adherence to standards in the Shoreline Management Initiative (SMI) Record of Decision would help to protect the reservoir from erosion and contamination. Under SMI, no septic tanks would be allowed on TVA land fronting residential subdivisions, which for Tims Ford would be below the 895 foot contour. Further, TDEC and TVA have a letter of agreement (1974) that no septic tanks or lines will be allowed below the 890-foot contour for Tims Ford Reservoir.

Subsidence sometimes occurs due to changes in subsurface drainage patterns, groundwater elevations, and alteration of geologic formations. These changes may appear during or after construction as a result of excavation, filling, groundwater pumping, and foundation loading. A slight potential might also exist for altering groundwater flow rates to domestic wells, streams, and springs used for water supplies. Areas that are the most susceptible to these potential problems are generally underlain by soluble carbonate rocks and exhibit karst features. Because of the presence of karst features, development under any of the alternatives would require appropriate planning and design based upon a sound geotechnical investigation in order to avoid significant impacts to groundwater and surface water quality in the area.

Neither TDEC nor TVA is aware of any groundwater problems from existing development in the area. Due to TDEC's provisions for permitting wastewater systems, underground storage tanks, and Class V injection wells, it is unlikely there would be cumulative adverse groundwater impacts in the area as a result of the proposed action.

#### **Alternative A**

Under Alternative A, additional development of either a recreational or residential nature could occur on as much as 2,821 acres. This means that ultimately 44 percent of plannable project land or 20 percent of the shoreline miles could be developed for residential or recreational uses. The presence of karst features increases the potential for groundwater contamination from development under any of the alternatives. However, the likelihood of such contamination would be reduced through case-by-case reviews conducted by TDEC in reviewing applications for wastewater disposal.

#### **Alternative B**

A balance of development and conservation would afford enhanced groundwater protection in the project area due to the commitment of a sizeable area to conservation and protection. Approximately 69 percent

of project lands would be allocated to Zone 3 (Sensitive Resource Protection) and Zone 4 (Natural Resource Conservation), all of which would tend to protect groundwater resources. The presence of karst features increases the potential for groundwater contamination from development under any of the alternatives. However, the likelihood of such contamination would be reduced by TDEC in case-by-case reviews of applications for wastewater disposal.

#### **Alternative B1**

As with Alternative B, the balance of development and conservation would afford enhanced groundwater protection in the project area due to the sizeable commitment of acreage to Sensitive Resource Protection and Natural Resource Conservation. Approximately 71 percent of project lands would be allocated to Zone 3 (Sensitive Resource Protection) and Zone 4 (Natural Resource Conservation), all of which would tend to protect groundwater resources. The addition of Zone 8 is anticipated to assist in protection of the reservoir by increasing shoreline buffers. The reallocation of Parcel 14 to Zone 4 would reduce the potential for groundwater impacts from residential development.

#### **Alternative C**

Alternative C is likely to produce the greatest impact to groundwater resources of the project area, primarily due to extensive residential development of up to 40 percent of project lands. The likelihood of groundwater effects from development of project lands surrounding the reservoir, as well as cumulative effects from development of project lands added to other ongoing development, would increase with time under this alternative.

#### **Alternative D**

Under this alternative, current hydrogeologic conditions would remain relatively unchanged. The allocation of the majority of lands for conservation and protection would minimize groundwater impacts within the project area, causing the least impact of any of the alternatives.

### **3.2 SITE SOILS**

#### **3.2.1 AFFECTED ENVIRONMENT**

The soils in the Tims Ford Project area occur within the physiographic division of the Highland Rim and Nashville Basin sections of the Interior Low Plateau Province. These soils of the area reflect their geologic origin. The area is underlain by sedimentary rocks that range from the basal Pennsylvanian age to the Upper Ordovician. On the Highland Rim, soils are formed from limestone, dolomite, sandstone, shale, and alluvium/colluvium. The soils are dominantly loamy but some, such as those derived from limestone and dolomite, are cherty and clayey. Soil thickness is highly variable but averages 39.4 feet on the Highland Rim (Moore, 1976). Permeability is expected to be less than 0.00012 feet per second (May, et al., 1983) for all soils other than alluvium/colluvium. Central Basin soils are derived from phosphatic limestone, cherty limestone, shale, and sediment. The soils are loamy, silty, clayey, and cherty. Although permeability is expected to fall within similar ranges as those of Highland Rim soils, the thickness of Central Basin soils averages 3.9 feet (Moore, 1976).

Of the total 28 mapped soil series which occur within the project area, the most prevalent classification of soil is in the Baxter series (Table 3.2-1). Baxter soils occur on about 45 percent of the total area located in Franklin County. This soil series is described as a well-drained soil which occupies the escarpment and the steeper slopes along drainage ways of the Highland Rim. It has formed under a deciduous forest cover and is underlain by cherty limestone. Chert fragments on the surface and in the plow layer interfere with tillage. The soil is strongly acidic and moderately well supplied with plant nutrients. Except in the thin surface layer, the content of organic matter is low. Run-off is rapid, but internal drainage is medium. The soil is permeable by plant roots, air, and moisture. The moisture-supplying capacity is fair. The undulating phases of this series are well suited to crops commonly grown in the area. It is moderately productive, but with proper management practices productivity can be increased.

The Bodine soil series occurs in about 25 percent of the total Franklin County project area. This excessively drained soil was derived from cherty limestone material. This soil is not suited to crops that

require tillage because it is cherty, steep, and of low water-supplying capacity and fertility. It is also poorly suited for pasture.

About 10 percent of the total Franklin County area has a Cumberland and Etowah mixed alluvium which is composed of chiefly limestone materials. These well-drained soils are on the old high stream terraces and on old terrace-like colluvial or local alluvial deposits that were left by the receding Cumberland Escarpment. They occur in small areas widely distributed over the Highland Rim section of the county. They were formed from materials that washed mainly from uplands underlain by limestone. Some sandy material from the Cumberland Plateau was intermixed. When these soils occur on the gently sloping areas, they are well suited to all of the common field crops. They are easily tilled and can be worked within a wide range of moisture conditions. Soil and plant nutrients are easily conserved.

**Table 3.2-1 Soil Series Occurring in the Franklin County Project Lands**

Soil Series	Parent material or parent rock <sup>1</sup>	Occurrence in Area <sup>2</sup>	
		Acres	Percent
Baxter	Residuum, cherty limestone	1,684	44.8
Bodine	Residuum, cherty limestone	936	24.9
Bruno	Alluvium, mainly sandstone material, some limestone	7	0.2
Cumberland and Etowah	Old mixed alluvium, chiefly limestone material	405	10.8
Cumberland	Old mixed alluvium, chiefly limestone material	82	2.2
Decatur	Residuum, high-grade limestone	1	<0.1
Dellrose	Creep material from cherty limestone, moderately phosphatic limestone influence	197	5.2
Dewey	Residuum from high-grade limestone	56	1.5
Dickson	Residuum, loess over cherty limestone	103	2.7
Emory	Colluvium or local alluvium, chiefly high grade limestone material	31	0.8
Ennis	Alluvium, chiefly cherty limestone material	2	<0.1
Greendale	Colluvium, chiefly cherty limestone material	5	0.1
Gullied land	A land type on which erosion has formed an intricate pattern of gullies on limestone material	15	0.4
Hermitage	Old colluvium, chiefly high-grade limestone material	3	0.1
Holston	Old mixed alluvium, chiefly sandstone and shale material	15	0.4
Humphreys	Alluvium, cherty limestone material	2	0.1
Huntington	Mixed alluvium, chiefly limestone and sandstone material	1	<0.1
Lindside	Alluvium, chiefly limestone and sandstones	4	0.1
Melvin	Alluvium, chiefly limestone material	4	0.1
Mimosa	Residuum, phosphatic clayey limestone material	8	0.2
Mimosa	Mines, pits, and dumps	37	1.0
Mountview	Residuum, loess over cherty limestone material	79	2.1
Riverwash	A land type consisting of stony gravelly and sandy alluvium	2	<0.1
Rockland	A land type that has numerous ledges and outcroppings of limestone	76	2.0
Sequatchie	Old mixed alluvium, chiefly sandstone, but some limestone	4	0.1
Waynesboro	Old mixed alluvium, chiefly sandstone, but some limestone	4	0.1

<sup>1</sup> - Source: USDA-SCS, 1958. Soil Survey of Franklin County, Tennessee

<sup>2</sup> - ArcInfo Soils Coverage. Jimmie J. Kelsoe. 1999.

The remaining 23 soil series occur in less than 20 percent of the total Franklin County area (Table 3.2-1). The complete description and acreage of the soil mapping units are listed in Appendix H, Table H-1. The soils in Parcel 24 and certain areas of Parcel 7 and 8 are not mapped on Moore County's soil survey. All other areas of the county have been mapped in this survey. The soil series which occur in the mapped areas are Dellrose, Bodine, Fullerton, Mimosa, and Barfield-Ashwood-Rock outcrop complex. Descriptions of these soils are listed in Appendix H, Table H-2.

The temperate and humid climate in Franklin and Moore Counties provides a long growing season and sufficient moisture to nearly all the common field crops. There is no distinct dry season, and crops such as fall-sown small grains and crimson clover seldom suffer from winter kill. The principal crops grown are corn, wheat, soybeans, crimson clover, lespedeza, and alfalfa.

Prime farmland soils, as defined by the USDA, are those that have the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops. They have properties needed for the economic production of sustained high yields of crops. Prime farmland soils may presently be in use as crop land, pasture land, range land, forest land, or other uses, but cannot be urban or built-up land. The conversion of farmland and prime farmland soils to industrial and other non-agricultural uses essentially precludes farming the land in the foreseeable future. Recognizing the serious impacts on food and fiber production from such long-term land use trends, the Federal Farmland Protection Policy Act (FFPPA) was signed into law in 1981 (U.S.C.4201 at seq.). Regulations implementing the FFPPA were first promulgated in 1984 and then amended in 1994. (7 CFR Part 658).

There are a total of 21 soil mapping units in the project area classified as prime farmland soils. These soils occur on the gently rolling and undulating slopes of the area. The prime farmland soils occur on 540 acres. These prime farmland soils are of the Baxter, Cumberland / Etowah mixtures, Decatur, Dewey, Dickson, Emory, Fullerton, Greendale, Hermitage, Holston, Humphreys, Huntington, and Lindsides soil series. The most frequently occurring classification is the undulating phase of the Baxter series. The parcels 51, 53, 67, 70, 72, 76, 78, and 79 contain greater than 50 percent of the total acreage in prime farmland and 50 percent or more of that prime farmland is currently used for agriculture (see Table 3.2-2). TVA has completed a Farmland Conversion Impact Rating (Form AD 1006), with assistance from USDA-NRCS staff in Nashville, Tennessee, for those parcels where prime farmland is to be converted to non-agricultural land use.

**Table 3.2-2 Parcels with Prime Farmland and Portions Currently Used for Agriculture**

<b>Parcel</b>	<b>Total Acres</b>	<b>Prime Farmland<sup>1</sup> (acres)</b>	<b>% Prime Farmland</b>	<b>Agriculture Land Use<sup>2</sup> (acres)</b>	<b>Existing Agriculture Licenses (acres)</b>	<b>Prime Farmland Used for Agriculture (acres)</b>
7	157	4	3	48	60	3
12	80	16	20	17	10	10
13	24	1	4	9	--	--
14	119	14	12	27	32	4
15	199	13	7	15	--	1
19	46	9	20	7	10	4
26	140	9	6	4	8	2
27	61	9	15	31	--	4
31	176	2	1	87	88	1
36	204	21	10	64	--	10
37	377	21	6	89	8	1
39	46	14	30	14	3	8
41	462	34	7	52	39	17
42	366	70	19	93	141	28
43	83	10	12	15	--	5
44	58	20	34	39	30	17
46	111	8	7	41	36	6
47	8	1	13	1	--	1
51	49	29	59	37	25	24
53	30	22	73	0	--	--
63	81	16	20	11	23	11
67	15	11	71	26	30	19
70	4	3	62	8	8	5
72	5	4	86	13	5	11
75	112	9	8	31	37	4
76	132	76	58	62	63	47
78	13	13	100	13	10	13
79, 79A, 79B	85	48	56	58	4	34
80	26	4	15	6	6	2
81	19	7	37	12	10	3

<sup>1</sup>- ArcInfo Soils Coverage. TVA. Jimmie J. Kelsoe. 1999

<sup>2</sup>- ArcInfo Land-Use Coverage of the Tims Ford Project Area, TVA, RW Major. 1998.

### **3.2.2 ENVIRONMENTAL CONSEQUENCES**

For evaluating the environmental consequences to prime farmland, those parcels with potential to be converted to non-agricultural land use were included for analysis. These parcels were allocated to either Zone 6 (Recreation) or Zone 7 (Residential Development/Access). Parcels 78 and 83 have a pre-existing land-use classification as Industrial/Commercial Development and were not included.

The criteria in Form AD 1006 ("Farmland Conversion Impact Rating"), were used in rating the value of the parcels for farmlands. This rating was done with the assistance of the USDA-NRCS staff. The rating is based on soil characteristics as well as site assessment criteria such as agricultural and urban infrastructure, support services, farm size, compatibility factors, on-farm investments, and potential farm production loss to the local community and county. Under the regulations implementing the FFP, sites

receiving a score of 160 total or more must be given a higher level of consideration for protection. The scores and ratings for each alternative are listed in Table 3.2-3.

**Table 3.2-3 Comparison of Alternatives For Conversion Of Prime Farmland To Non-Agriculture Land Use**

Soil Classification	Alternative			
	A	B <sup>c</sup>	C	D
Prime Farmland Converted (acres)	--	248 <sup>a</sup> (240 <sup>b</sup> )	402 <sup>a</sup> (392 <sup>b</sup> )	139 <sup>a</sup> (23 <sup>b</sup> )
Land Evaluation Score	--	20	54	35
Site Assessment Score	--	56	56	49
Farmland Conversion Impact Rating (Form AD 1006)	--	76	110	84

<sup>a</sup> - Acreage in original parcel allocations which were used for the rating, AD 1006 (see Appendix H ).

<sup>b</sup> - Acreage of prime farmland since modification of parcel allocations.

<sup>c</sup> - The farmland conversion impact rating for Alternative B1 would be approximately the same as Alternative B.

#### **Alternative A**

The amount of farmland converted to non-agricultural use would depend on the outcome of case-by-case reviews conducted by TVA and TDEC. For land to be allocated by TVA for non-agricultural use, the applications of the rating criteria using Form AD 1006 would be part of the NEPA review at that time.

#### **Alternatives B, B1, C, and D**

Under Alternative B, there are 14 parcels with potential to be converted to non-agricultural land-use areas which contain prime farmland soils (Table 3.2-4). Of the 240 acres of prime farmland in these parcels, about 62 percent is used currently for agriculture.

Under Alternative B1, the total acreage of prime farmland is 226 acres in 13 parcels that are allocated for Zone 6 or 7 (Table 3.2-5). Approximately 64 percent of this prime farmland is currently in agricultural use. Also, Alternative B1 includes 33 acres in parcels allocated for Zone 8. Probably about 20 percent of this acreage is prime farmland. This is the average percentage rate in the other parcels of the project which have the soils delineated and identified as prime farmland. Thus, Alternative B1 contains about 233 acres of prime farmland with potential to be directly impacted.

Under Alternative C, the total acreage of prime farmland is 392 acres allocated for Zone 6 or 7 (Table 3.2-6). Approximately 54 percent of this prime farmland is currently in agricultural use. Under Alternative D, the preservation alternative, there are 23 acres of prime farmland with the potential to be converted to non-agricultural land. About 20 percent of this land is currently being used for farmland (Table 3.2-7).

Changes were made in the allocation of parcels since Form AD 1006 (Table 3.2-3) was completed. All the alternatives have less prime farmland than was reported, and Alternative B1 has been added. Because the prime farmland for Alternative B1 is essentially the same as for Alternative B, and the total score for each alternative is much lower than the 160 threshold, these changes would not significantly change the rating of the prime farmland for either alternative.



**Table 3.2-4 Potential Conversion of Prime Farmland Soils for Alternative B**

Parcel	Zone	Total Acres	Prime Farmland <sup>1</sup> (acres)	% Prime Farmland	Agriculture Land Use <sup>2</sup> (acres)	Prime Farmland Used for Agriculture (acres)
7	7	157	4	3	48	3
12	6	80	16	20	17	10
14	7	119	14	12	27	4
19	6	46	9	20	7	4
27	6	61	9	15	31	4
31	7	176	2	1	87	1
36	7	204	21	10	64	10
46	7	111	8	7	41	6
51	7	49	29	59	37	24
76	6	132	76	57	62	47
79, 79A, 79B	6	85	48	56	58	34
80	6	26	4	15	6	2

<sup>1</sup>- ArcInfo Soils Coverage. TVA. Jimmie J. Kelsoe. 1999

<sup>2</sup>- ArcInfo Land-Use Coverage of the Tims Ford Project Area, TVA, RW Major. 1998.

**Table 3.2-5 Potential Conversion of Prime Farmland Soils for Alternative B1**

Parcel	Zone	Total Acres	Prime Farmland <sup>1</sup> (acres)	% Prime Farmland	Agriculture Land Use <sup>2</sup> (acres)	Prime Farmland Used for Agriculture (acres)
7	7	157	4	3	48	3
12	6	80	16	20	17	10
19	6	46	9	20	7	4
27	6	61	9	15	31	4
31	7	176	2	1	87	1
36	7	204	21	10	64	10
46	7	111	8	7	41	6
51	7	49	29	59	37	24
76	6	132	76	57	62	47
79, 79A, 79B	6	85	48	56	58	34
80	6	26	4	15	6	2

<sup>1</sup>- ArcInfo Soils Coverage. TVA. Jimmie J. Kelsoe. 1999

<sup>2</sup>- ArcInfo Land-Use Coverage of the Tims Ford Project Area, TVA, RW Major. 1998.

Implementation of Alternative C, which includes more prime farmland in Zone 7 than the other alternatives, would have the greatest potential to adversely impact prime farmland while the adoption of Alternative D would have the least. However, in direct impacts, the rating for each alternative is below the 160 score that is suggested as a level where further consideration for agricultural land protection be given. Based on this appraisal, the direct impact on farmlands is determined to be insignificant for any of the proposed action alternatives.

**Table 3.2-6 Potential Conversion of Prime Farmland Soils for Alternative C**

Parcel	Zone	Total Acres	Prime Farmland <sup>2</sup> (acres)	% Prime Farmland	Agriculture Land Use <sup>2</sup> (acres)	Prime Farmland Used for Agriculture (acres)
7	7	157	4	3	48	3
12	6	80	16	20	17	10
13	7	24	1	4	9	0
14	7	119	14	12	27	4
19	6	46	9	20	7	4
26	7	140	9	6	4	2
27	6	61	9	15	31	4
31	7	176	2	1	87	1
36	7	204	21	10	64	10
37	7	377	21	6	89	1
39	7	46	14	30	14	8
42	7	366	70	19	93	28
44	7	58	20	34	39	17
46	7	111	8	7	41	6
47	7	8	1	13	1	1
51	7	49	29	59	37	24
75	7	112	9	8	31	4
76	6	132	76	58	62	47
79, 79A, 79B	6	85	48	56	58	34
80	6	26	4	16	2	2
81	7	19	7	37	12	3

<sup>1</sup>- ArcInfo Soils Coverage. TVA. Jimmie J. Kelsoe. 1999<sup>2</sup>- ArcInfo Land-Use Coverage of the Tims Ford Project Area, TVA, RW Major. 1998.**Table 3.2-7 Potential Conversion of Prime Farmland Soils for Alternative D**

Parcel	Zone	Total Acres	Prime Farmland <sup>1</sup> (acres)	% Prime Farmland	Agriculture Land Use <sup>2</sup> (acres)	Prime Farmland Used for Agriculture (acres)
27	6	61	9	15	31	4
79	6	28	14	51	28	14

<sup>1</sup>- ArcInfo Soils Coverage. TVA. Jimmie J. Kelsoe. 1999<sup>2</sup>- ArcInfo Land-Use Coverage of the Tims Ford Project Area, TVA, RW Major. 1998.**Indirect Impacts**

Development of the land around the reservoir, either residential or recreational, could potentially promote development in the surrounding area. Additional housing and commercial buildings could ultimately change the rural agricultural land use to more built-up land-use areas. This change has the potential of permanently converting prime farmland to non-agricultural land use because typically prime farmland has the best characteristics for building sites.

Based on population projection statistics (Section 3.12.4.1), growth for Moore and Franklin Counties is expected to increase about 10 percent for the next decade. Much of the potential growth that might occur in the area adjoining the project area would probably otherwise occur elsewhere in the counties; thus, on a regional scale the impacts to farmland would be insignificant.

Under Alternative B1, 51 parcels would be allocated to Zone 8. Thus, this would allow the development of community facilities and potentially the development of backlying properties into subdivisions. In order to assess indirect impacts on these backlying lands, a one-mile band surrounding the reservoir was identified which consists of 185,000 acres. Land-use data indicates that about 47 percent of this area is used for agriculture and about 39 percent is forest land which could be prime farmland (159,100 acres). 20 percent is the average percentage rate of prime farmland in the other parcels which have had the soils delineated and identified as prime farmland. Based on this 20 percent average, about 3,700 acres of land within this one-mile band could be prime farmland.

Two scales were used to assess impacts. One scale consisted of using the average size of all existing subdivisions around the reservoir; the average size was determined to be 50 acres. If each of the 51 parcels allocated to Zone 8 prompted development of a subdivision of at least 50 acres, then conceivably 2,550 acres could be converted to non-agricultural use. 510 of the 2,550 acres (20 percent) could be prime farmland. The second scale consisted of using the average of 50 acres of existing subdivisions per shoreline mile. Zone 8 could affect 9 miles of shoreline. Using this scale, we find that 450 acres could be impacted, and 20 percent (90 acres) of this land could be prime farmland. The results indicate a potential range of 90 to 510 acres of prime farmland that could be affected. This is an insignificant amount of acreage (less than one percent) within this one mile band; therefore, indirect impacts on prime farmland would be insignificant.

### **3.3 SURFACE WATER QUALITY**

#### **3.3.1 AFFECTED ENVIRONMENT**

The proposed project area lies within the Central Basin physiographic section of Tennessee. Tims Ford Reservoir is considered by the State to fully support designated uses. According to the EPA index of watershed health, the Upper Elk Watershed is generally in good condition, although the watershed is vulnerable to agricultural pollution and urban growth in the area. However, nutrient loads are currently affecting the reservoir. In addition, several tributaries have been adversely impacted. Woods Reservoir, upstream from Tims Ford, has been posted against catfish consumption due to high levels of PCBs in catfish flesh. The discharges from the dam at Woods Reservoir (Elk River Dam) are cold and low in DO (TDEC, 1996). Rock Creek, a tributary of Tims Ford, is impacted by a municipal sewage plant in Tullahoma and ongoing land development in the area. Dry Creek, another tributary, is impacted by siltation resulting from agriculture. One Tims Ford tributary, Boiling Fork Creek, is considered by TDEC to have regional significance for natural and scenic qualities, recreational boating, and recreational fishing. The Elk River has statewide significance for these categories and is considered as excellent to good fishery (TDEC, 1998).

Water quality parameters in the reservoir have been sampled since 1991 as part of TVA's Reservoir Vital Signs monitoring program. DO levels at the forebay (the area immediately behind the dam) in 1996 rated "poor." These levels, as in past years, were less than 2 milligrams per liter (mg/L) throughout most of the lower water column during the late summer (August-October), and at or near zero on the bottom from July through October. Chlorophyll levels (i.e., the amount of algae present), which are an indicator of primary productivity in the aquatic food chain, rated "good" at the forebay in 1996 and were higher than in any previous year. Sediment rating in 1996 was "fair" at the forebay where, as in previous years, elevated levels of nickel were found (TVA, 1997a).

Four sites were sampled ten times each for fecal coliform bacteria in 1996. Three of the sites (including the site at the Park), met bacteriological water quality criteria for water contact recreation. The swimming beach at Dry Creek had very high fecal coliform bacterial concentrations, likely due to the presence of high numbers of Canada geese (TVA, 1997a).

### 3.3.2 ENVIRONMENTAL CONSEQUENCES

Certain environmental and water quality problems are inherent due to the design of the reservoir. The impoundment slows the Elk River, causing it to drop its sediment load. At the same time, the broad expanse of water, compared to the original channel, causes temperature increases and promotes algae growth. The increased sediment load and temperature of the water drives oxygen levels down. These factors would affect water quality even if there were no development.

Faced with the water quality problems associated with reservoir design, environmental issues associated with development must be very carefully considered. The types of environmental consequences would be much the same for all listed alternatives, but the severity of these consequences can vary. The more development recommended by an alternative, the higher the potential for environmental problems. The main areas of concern are erosion and other environmental problems occurring during construction, pollution from improper operation or failure of wastewater treatment systems, and Nonpoint Source Pollution (NSP). TDEC has permitting and inspection rules in place that require wastewater treatment systems to be constructed and operated in such a manner that water quality should not be adversely affected. TDEC also has permitting rules in place that require control of storm water discharges from construction sites (see Appendix H for details on Tennessee's water pollution control regulations).

TDEC also issues Aquatic Resource Alteration Permits (ARAP) for any activity which involves the alteration of waters of the State. These may be issued as a general permit or individual permit. General ARAPs cover the following activities:

1. Construction of launching ramps
2. Alteration of wet weather conveyances
3. Minor road crossings
4. Utility line crossings
5. Bank stabilization
6. Sand and gravel dredging
7. Debris removal

Wastewater treatment systems can cause pollution either in the form of excessive nutrient loading, or fecal coliform bacteria if they are not properly designed, constructed, and maintained. Because wastewater treatment systems, including any future upgrades, must comply with all state requirements as defined in its NPDES permit, adverse water quality impacts would be minimized.

After development, improperly operated wastewater treatment systems and runoff from lawn fertilizer applications could increase nutrient loading on the reservoir. Higher nutrient levels would lead to increased primary production (algae growth). As algae populations die, their decomposition in deep waters of the reservoir would further eliminate an already exhausted oxygen supply during summer months. Continuous increases of nutrient loads in the reservoir would continue to impair the reservoir, which based on TVA's monitoring activities, is already considered to be in poor condition (TVA, 1988, 1994, 1995, 1996, 1997, 1998). Tracts designated as zones 2, 3, and 4 provide the best buffer between the reservoir and backlying areas where increased soil erosion runoff and nutrient loading would likely originate. Erosion and nutrient runoff would be expected to be higher from tracts designated as Zones 5, 6, and 7, where soil disturbance, runoff from paved surfaces, and nutrient sources would be located adjacent to the reservoir. Zone 8 provides landowners the incentive of gaining water access. In turn, such a zone creates a wider strip of shoreline to serve as a buffer, thereby promoting environmental protection.

Much of the data relating NPS to water quality is collected as part of the Clean Water Act (CWA). The CWA requires EPA to report to Congress every 2 years in the *National Water Quality Inventory: Report to Congress*. It was reported in 1996 that nutrients and metals are the most widespread pollutants impacting surveyed reservoirs, followed by siltation, oxygen-depleting substances, and noxious aquatic plants. Reservoirs are especially susceptible to nutrient over-enrichment and the accumulation of other pollutants (such as metals), because they retain their contents for long periods of time. Nutrient over-enrichment

can initiate a chain of impacts that includes algal blooms, low dissolved oxygen conditions, fish kills, foul odors, and excessive aquatic weed growth that can interfere with recreational activities. Agriculture is the most widespread source of pollutants impairing surveyed reservoirs, followed by unspecified nonpoint sources, atmospheric deposition, urban runoff and storm sewers, and municipal sewage treatment plants. Agricultural fertilizers and manure from animal operations can be a major source of nutrients.

### **Conclusion**

Alternative B and B1 designate a substantial acreage of the land on the Tims Ford Reservoir to Zone 3 (Sensitive Resource Protection) and Zone 4 (Natural Resource Conservation) categories. Designated types of development would be allowed in Zones 5, 6, and 7 which could increase the potential for adverse water quality impacts. Given the rules and regulations governing site disturbance and wastewater treatment, the additional protective measures for residential development in SMI, and the limited extent of development allowed, water quality in Tims Ford Reservoir is unlikely to be significantly degraded. Alternative B1 also adds parcels for Zone 8 (Conservation Partnership). The goal of the conservation partnership zone is to create a minimum 100-foot buffer in these areas in return for gaining water access for community water-use facilities. During the site specific review of each Section 26a application for a water-use facility, the slope, vegetation, soils and adjacent land use would be evaluated to determine the appropriateness of locating a facility at the proposed location and the specific conditions of the conservation partnership easement. This alternative could encourage more development on the adjoining private property which could have negative impacts on water quality in the area due to runoff from nearby parking lots and gas and oil from the bilge of boats using the ramp and community water-use facilities. Widening of the buffer zones would provide more protection from potential soil erosion and reduce the runoff of fertilizers and other pollutants from residential lawns. Because parking lots are not allowed within the buffer area, impacts associated with parking lot runoff have been reduced. In comparison with Alternative B, Alternative B1 is expected to provide greater protection to water quality in light of the expected conservation partnerships.

In general terms, Alternative C has the most potential for water quality impacts because it would allow the most development of lands surrounding the reservoir, with the primary emphasis on residential development. Alternative C would result in the highest level of impacts related to erosion, chemical and nutrient runoff, and wastewater; it could degrade reservoir water quality conditions. Implementation of Alternative A would likely result in the next higher level of impacts because it does not establish a clear path for land management or disposition and does not designate parcels primarily for natural resource conservation. Adoption of Alternative D would likely result in minimal impacts to reservoir water quality because no new development would be allowed. Maintenance of a relatively undisturbed shoreline would provide the least potential for impacts resulting from erosion, chemical and nutrient runoff, and wastewater treatment systems.

## **3.4 AQUATIC ECOLOGY**

### **3.4.1 AFFECTED ENVIRONMENT**

Tims Ford Reservoir has nine major tributaries in addition to the Elk River and several smaller tributaries. The tributaries are shown in Table 3.4-1.

The reservoir is located in the Highland Rim Providence of central Tennessee. The Highland Rim is a giant crater-like geologic structure in central Tennessee, extending north into Kentucky and south into Alabama. The Highland Rim is composed primarily of limestone, chert, and some shales. Streams in this region are characterized by coarse chert gravel and sand substrates interspersed with bedrock areas, moderate gradients, clear waters, and moderate to low productivity, and thus little aquatic vegetation except near spring sources. The Highland Rim, because of its geologic complexity and numerous semi-independent drainage systems, harbors the most diverse fish fauna of any region of comparable size in North America (Etnier and Starnes, 1993). Observation of aquatic habitat and substrate types was greatly enhanced by an extreme drawdown in 1998 which was necessary because of a leak in the reservoir rim near the dam. Most of the reservoir's embayments exhibit steep banks with gravel and cobble substrate. Some have steep banks on one shore, while the other is relatively flat with sand and silt substrate. Rock

Creek exhibited gradual slopes with sand and silt substrate and with scattered patches of gravel and cobble. Shoreline areas that have not been impacted by commercial and residential development have wide (more than 18 meters) buffer zones with mostly thick mixed hardwood and shrub canopy. A very small percentage (5 percent or less) of Tims Ford shoreline has been impacted by dredging. Shoreline erosion is severe in some areas where there is heavy wave action resulting from winds and boat traffic. Erosion ranging from minor to severe probably affects more than 30 percent of the reservoir.

**Table 3.4-1 Major and Minor Tributaries of Tims Ford Reservoir**

Major Tributaries	Minor Tributaries
Lost Creek	Anderson Branch
Hurricane Creek	Anderton Branch
Little Hurricane Creek	Winchester Springs Branch
Rock Creek	Wiseman Branch
Taylor Creek	Matthew Branch
Boiling Creek	
Town Creek	
Kitchens Creek	

Benthic (lake bottom) biological samples were taken in the reservoir forebay (the area of the reservoir nearest the dam) from 1994 through 1996 as part of TVA's Reservoir Vital Signs monitoring program. Sampling and data analysis based on seven parameters (eight parameters prior to 1995) identified a bottom community in the forebay that rated "poor" in all years due mainly to the presence of chironomids (midge larvae) and tubificid worms, a type of animal very tolerant of low DO levels. The likely cause of the consistently poor bottom community at the forebay is the very long water retention time (246 days in 1996), which allows water to stagnate and become devoid of DO near the reservoir bottom (TVA, 1995, 1996, 1997a).

The Reservoir Vital Signs monitoring program has also included annual fish sampling at Tims Ford since 1992. Compared to similar tributary reservoirs, the forebay fish assemblage has rated "fair" or "good" each year through 1998 based primarily on fish species diversity and composition. Compared to similar tributary reservoirs, the forebay fish assemblage has rated "fair" or "good" each year through 1998. The fish assemblage at the mid-reservoir station has rated "good" in all years except 1993 when it rated "excellent." These generally good ratings are based primarily on fish species diversity and composition. Also considered in the rating is the percentage of sample represented by omnivores and insectivores, overall number of fish collected, and the occurrence of fish with anomalies such as diseases, lesions, parasites, deformities, etc. (TVA, 1996, 1997, 1999). A total of 30 fish species, including the hybrid saugeye, were collected in the fall 1996 electrofishing and gill netting sample at the forebay and transition zone. More abundant species were bluegill, carp, yellow bass, gizzard shad, spotfin shiner, and walleye (TVA, 1999).

TWRA studies have found that since 1990, both largemouth and smallmouth bass at Tims Ford have shown increases in numbers caught, probably due to the implementation of a minimum size limit in 1990. Crappie populations remain low and often are composed of only one dominant year class; walleye populations are at moderately low levels (TWRA, 1995a). Analysis of creel data indicates that the species most sought by sport anglers are largemouth bass and smallmouth bass. Higher percentages of fishing efforts were also seen for striped bass and crappie (TWRA, 1995a).

The overall ecological health rating for Tims Ford Reservoir in 1998 sampling was "poor." The overall rating was comprised of measurements of chlorophyll (i.e., primary productivity), dissolved oxygen, fish, benthic animals, and sediment quality. Sediment quality rated fair at the forebay and the mid-reservoir sites. Elevated levels of nickel were again found at the forebay, while low levels of chlordane were detected in sediments at the mid-reservoir station. The overall ecological condition of Tims Ford Reservoir continues to progressively decline. Consistent problem areas are poor DO and benthic community conditions. The main reason for the lower overall reservoir rating in 1998 compared with 1996 was increased chlorophyll levels, which were the highest recorded at both sampling stations.

### **3.4.2 ENVIRONMENTAL CONSEQUENCES**

The potential for impacts to aquatic resources depends largely upon the amount of alteration to a natural shoreline condition that would occur under the various alternatives. These alterations include impacts to shoreline (riparian) vegetation, vegetation on backlying lots, and changes in land uses. Shoreline vegetation (particularly trees) provides shade, organic matter which is a food source for benthic macroinvertebrates, shoreline stabilization. Trees provide aquatic habitat (cover) as they fall into the reservoir. Shoreline vegetation and vegetation on backlying land provide a buffer zone which functions to filter pollutants from surface runoff while stabilizing erodible soils.

Preservation of a natural shoreline condition, to the extent possible, is particularly important on reservoirs such as Tims Ford. Shoreline development can greatly modify the physical characteristics of adjacent fish and aquatic invertebrate habitats, which can result in dramatic changes in the quality of the fish community. One of the most detrimental effects of shoreline development is the removal of riparian zone vegetation. Removal of this vegetation can result in loss of fish cover and shade (which elevates surface water temperatures). Fish spawning habitat, such as gravel and woody cover, can be rendered unsuitable by excessive siltation and erosion which can occur when riparian vegetation is cleared (TVA, 1999a).

#### **Alternative A**

Under Alternative A, 31 miles of shoreline would be allocated to Zone 3 (Sensitive Resource Management) and 82.6 miles of shoreline would be allocated to Zone 4 (Natural Resource Conservation). This alternative allocates less shoreline miles to these zones than Alternatives B or D. Sensitive resource management and natural resource conservation activities may be undertaken as a secondary consideration on some tracts forecasted for various uses (such as public recreation), but may not be a primary consideration when land-use decisions affecting those tracts are made. This alternative would allow residential developments (with associated impacts) on project lands to potentially continue at higher levels than Alternative B. Based on the length of shoreline available for development, overall aquatic impacts under Alternative A would likely be similar to Alternative C and higher than Alternative B (depending on the extent of future residential development under the various alternatives).

#### **Alternative B**

Under Alternative B, natural resource protection and conservation activities would be an important factor in deciding the type and degree of shoreline development. There would be 31 miles of shoreline in the sensitive resource protection category and 117.3 miles of shoreline in the natural resource conservation category. This would afford protection of sizable stretches of littoral (near shore) aquatic habitat which is the most productive region of a reservoir. Important fish species utilize such shorelines because of their spawning requirements, submerged cover (i.e., rocks, logs, brush, etc.), and the availability of aquatic invertebrates and small fish as a food source. Only Alternative D would allow less residential use of shoreline. Although any development of the shoreline could potentially impact aquatic ecology, selection of Alternative B would likely result in insignificant impacts to aquatic resources.

#### **Alternative B1**

Under Alternative B1, Balanced Land Development with Conservation Partnership, the buffers in Zone 8 would be wider due to partnerships with adjacent landowners. This alternative could encourage more development on the backlying lands and it could open the shoreline for development of community water-use facilities, boat ramps, and similar facilities which could have negative impacts on water quality in the area due to runoff from nearby parking lots and gas and oil from the bilge of boats using the ramp and water-use facilities. The increase in turbidity and sedimentation resulting from erosion from these activities could negatively impact aquatic resources. Widening of the buffer zones would provide more protection from potential soil erosion and reduce the runoff of fertilizers and other pollutants from residential lawns. Because parking lots are not allowed within the buffer area, impacts associated with parking lot runoff have been reduced.

#### **Alternative C**

Adoption of Alternative C would result in the most potential for aquatic impacts. Alternative C affords protection of fewer miles of shoreline in the natural resource conservation zone (82.6 miles) than either

Alternative B or D and would allow the highest level of residential access. Construction of new homes with required sewage treatment facilities could create potential impacts to the aquatic community. Aquatic habitat in the littoral zone is influenced by backlying land use that causes the removal of trees and other vegetation and turbidity and sedimentation resulting from erosion from construction activities.

#### **Alternative D**

Under Alternative D, the shoreline would remain essentially unchanged with respect to aquatic community. Under this alternative, there would be little, if any, potential for additional impacts from soil disturbance resulting from residential construction, no potential water pollution from septic tanks, and no new industry with waste water discharges or associated alterations of littoral aquatic habitats.

#### **Summary**

Selection of Alternative D would best protect the aquatic community from future impact by restricting shoreline development to existing conditions. Alternative A and C would pose the greatest threat for aquatic impacts in that it would protect fewer miles of shoreline and would allow more residential development with the accompanying terrestrial disturbances. Alternatives B and B1 would allow more shoreline disturbances than Alternative D but would offer fewer miles of shoreline for residential development than A or C. Alternative B1 would allow the development of boat ramps and community facilities and could result in more residential development near Zone 8. This could have a negative impact on water quality and aquatic resources.

Although adoption of Alternative D would provide the most protection for the aquatic community, the health of the bottom (benthic) community of the reservoir will continue to be "poor" due to low Dissolved Oxygen (DO) levels resulting from the very long water retention time of the reservoir. Selection of any other alternative would add to the aquatic community problems by adding nutrients from fertilizers on lawns, failed sewage systems, and siltation from construction activities.

### **3.5 TERRESTRIAL ECOLOGY**

#### **3.5.1 AFFECTED ENVIRONMENT**

The Tims Ford Reservoir area typically contains forests comprised of oaks, hickories, maples, and elms. Species composition varies greatly because of differences in relief, soil fertility, moisture, and history of human disturbance. Tims Ford lies within Franklin and Moore Counties, with the largest portion occurring in Franklin County. Arnold Engineering Development Center (AEDC) and Woods Reservoir, under AEDC's control, are located upstream and northeast of the reservoir. Most of the lands located to the east and south of Tims Ford, extending to the Cumberland Plateau, are open and in agricultural production.

In general, Tims Ford Reservoir lands are characterized by steep forested slopes near the water (riparian zone) with managed open lands and residential development occurring on the flatter ridgetops. Rock outcrops are common on the steepest shoreline areas. Approximately 90 percent of the shoreline on Tims Ford Reservoir is forested. This forested zone varies in width, from a few feet to hundreds of feet, but is relatively contiguous except for areas that have been cleared fronting existing residential lots and scattered agricultural tracts. A variety of land-use patterns occur around the shoreline including public and private residential developments, developed recreational sites, one state park, unmanaged forest land, and managed agricultural land. Fifty-one public and private subdivisions and private licenses currently affect 52.4 miles of shoreline on Tims Ford Reservoir. Backlying private lands with low relief and tillable soils have been cleared of forest and are currently managed for pasture, hay, or row crop uses. Approximately 65-70 percent of the adjoining private lands within 0.25 miles of the reservoir are managed as open lands. Narrow bands of hardwoods occur within drainages, in small woodlots, and along fence rows, but no large contiguous forested tracts occur in close proximity to the reservoir.

The 6,453 plannable acres are represented by a mixture of forest types interspersed with managed open lands. Forested lands are dominated by hardwood types including upland hardwoods, upland hardwoods mixed with eastern red cedar, and bottomland hardwoods. Remaining forested lands are dominated by pure stands of eastern red cedar. Bottomland hardwoods and wetlands are both extremely rare on Tims



Ford Reservoir, occurring primarily within parcel 63. This parcel has been identified as one of the most ecologically significant areas on the reservoir. Upland hardwoods are dominated by oaks (white, black, scarlet, and chestnut), blackgum, sourwood, and hickory. Beech, sugar maple, basswood, and yellow poplar are common on more mesic sites. Bottomland hardwoods are dominated by box elder, sycamore, river birch, and hop hornbeam. Large mature deciduous forests are rare on Tims Ford and occur primarily in areas that were too steep to easily log or develop. In general, forested lands occur along the shoreline and represent what is known as the riparian zone. Recent botanical surveys revealed that an exotic (i.e., non-native) plant, Nepal grass (*Microstegium viminium*), had invaded the herbaceous layer within many upland forest stands. Another exotic plant, sericea lespedeza (*Lespedeza cuneata*) grows commonly along much of the shoreline near the water. Many of the scenic, steep shoreline areas (many with rock outcrops) are dominated by shrubs including mountain laurel (*Kalmia latifolia*), hydrangea (*Hydrangea arborescens*), ninebark (*Physocarpus opulifolius*), Virginia willow (*Itea virginica*), and alder (*Alnus serrulata*).

Managed open lands and areas reverting to forests occur mainly on flatter ridgetops and on areas with more gentle relief. Open lands are dominated by fescue pasture and a small amount of corn and soybean row-crop land. The remainder is in maintained lawns fronting residential developments and abandoned reverting fields, dominated by broom sedge and eastern red cedars. TERDA administered 71 active agricultural licenses (1,141 acres) principally for hay and pasture usage. Domestic livestock grazing in adjoining forest lands is common and has impacted the quality of upland forests in some areas.

Natural resource inventories have identified a diversity of plant and animal life on Tims Ford Reservoir lands. This can be attributed to the diversity of ecological communities and topography. Mammals commonly found in these habitats include the gray squirrel, white-tailed deer, woodchuck, eastern cottontail rabbit, white-footed mouse, raccoon, opossum, and gray fox. Bird species using these habitats throughout the year include the eastern wild turkey, giant Canada goose, northern bobwhite quail, various woodpeckers, the eastern bluebird, song sparrow, brown thrasher, northern mockingbird, and the northern cardinal. Neotropical migrant birds include yellow-billed cuckoos, red-eyed vireos, yellow-throated warblers, and indigo buntings. Eastern box turtles, black rat snakes, and five-lined skinks are common reptile species utilizing these habitats. Many additional species known to utilize Project lands are listed by community type in Table H-3 in Appendix H. Plant and animal species listed as endangered, threatened, of special concern or in need of management occurring in the area are discussed in section 3.6.

According to the Tennessee Wildlife Resources Agency, lands around the Tims Ford Reservoir receive heavy hunting pressure for deer, turkey, and quail. Current habitat conditions provide excellent foraging and brood habitat for wild turkey populations but only fair populations and habitat for quail and rabbit. TWRA ranks Tims Ford land as excellent whitetailed deer habitat and reports good deer densities. Tims Ford Reservoir is not located within a major waterfowl flyway and does not receive significant migratory waterfowl use. A local population of resident Giant Canada Geese are present on the reservoir and have created past water quality and recreation concerns, especially around public-use areas.

### 3.5.1.1 UNCOMMON HABITATS/COMMUNITIES

The Tims Ford Lands Planning Parcels contain nine special habitat types, all of which contribute to the reservoir's biological and landscape diversity. These habitats are locally uncommon and each has attributes which add significantly to the reservoir's landscape diversity. The special habitat areas are marked on accompanying resource maps.

**Shale Barren (Parcel 37)** — The single occurrence of this habitat is located at the end of a very narrow peninsula on the east side of the Little Hurricane Creek embayment. Edges of the end of the peninsula consist of 5-foot high limestone outcrops topped with shale. The shale in the center of the barren is loose with no vegetation. The open barren occupies approximately 150 feet of the peninsula. Plant species of the open barren include St. John's Wort (*Hypericum gentianoides*), whitlow-wort (*Paronychia fastigiata*), three-awn grass (*Aristida longespica*), and blue curls (*Trichostema dichotomum*). Although no state-listed plant species occur here, this area represents a habitat unique to the general area.

**Extensive Wetlands (Parcel 63)** — This habitat, approximately 100 acres, is located downstream of the junction of Paynes Church Road and the Elk River. A large wetland complex encompasses temporarily and seasonally flooded areas in the Elk River floodplain north of Bethpage Road and seasonally and semi-permanently flooded areas in the reservoir south of Bethpage Road to River Mile 165. In the area south of Bethpage Road the wetland consists of an emergent marsh-open water complex dominated by soft rush (*Juncus effusus*), wool-grass (*Scirpus cyperinus*), black willow (*Salix nigra*), buttonbush (*Cephalanthus occidentalis*), boltonia (*Boltonia asteroides*), and mallow (*Hibiscus moscheutos*). A portion of the area was formerly mined for sand and gravel, but is now inundated and has converted to wetland. Although no state-listed plant species have been found here, this habitat provides foraging areas and potential nesting habitat for osprey (*Pandion haliaetus*), great egret (*Casmerodius albus*), snowy egret (*Egretta thula*), double-crested cormorant (*Phalacrocorax auritus*), least bittern (*Ixobrychus exilis*), and king rail (*Rallus elegans*).

**Bottomland Hardwood Forest (Parcel 63)** — One large bottomland hardwood forest was found in the project area. The forest is located north of the Elk River, east of Paynes Church Road. This forest has a high diversity of plants and animals and contains many wetland areas. Species of trees found at this site include box elder (*Acer negundo*), sycamore (*Platanus occidentalis*), river birch (*Betula nigra*), and hop hornbeam (*Ostrya virginiana*). Stands of river cane (*Arundinaria gigantea*) occur in some areas, and sphagnum moss occurs infrequently. Herbaceous species include false nettle (*Boehmeria cylindrica*), trumpet creeper (*Campsis radicans*), triadenum (*Triadenum walteri*), river oats (*Chasmanthium latifolium*), and loosestrife (*Lysimachia nummularia*). Two state-listed plant species, spreading false-foxglove (*Aureolaria patula*) and southern rein-orchid (*Platanthera flava* var. *flava*), are found here. Spreading false-foxglove is found within 40 feet of the river, and the southern rein-orchid occurs in forested wetlands in several places. State-listed southeastern shrews (*Sorex longirostris*) and mole salamanders (*Ambystoma talpoideum*) were observed at two different sites at this tract. These forests contain many woodland depressions that are seasonally flooded (vernal ponds). Large breeding aggregations of woodland salamanders occur in these depressions during winter months. This habitat is rare on Tims Ford Reservoir, making these breeding sites regionally significant.

**Limestone Rock Outcrops (Parcels 20 and 63)** — Three limestone outcrops were found on Tims Ford Project lands. This community type, which provides habitat for a variety of plants and animals, is rare on Tims Ford Reservoir.

A large limestone outcrop is located adjacent to Hurricane Creek on Parcel 20 in a mid-aged, deciduous woodland. This rock outcrop represents suitable habitat for the Allegheny woodrat (*Neotoma magister*), eastern small-footed bats (*Myotis leibii*), and southeastern shrew.

A limestone ledge is located along the flowing section of the Elk River on Parcel 63. This ledge is quite extensive, ranging up to 10 feet in height. Shrubs growing on the ledge include hydrangea and Virginia sweet-spire (*Itea virginica*). Climbing hydrangea (*Decumara barbara*), a climbing vine, occurs here and was not observed elsewhere on Tims Ford Reservoir. The slope above this ledge is acidic and dominated by mountain laurel and yellow root (*Xanthorhiza simplicissima*). The state-listed species, spreading false-foxglove, was found on this ledge.

An area of flat, exposed limestone approximately 50 feet by 20 feet is also located on Parcel 63. This small site, located adjacent to the Elk River, is subject to occasional flooding. When the reservoir level is down, the area of exposed flat rock is much larger. It appears that this limestone habitat was larger prior to impoundment. The introduced species, sericea lespedeza, is common here. The coastal plain species mitreola (*Mitreola petiolata*) grows here and was not seen elsewhere on Tims Ford Reservoir. Mecardonia (*Mecardonia acuminata*) is common here. No state-listed plant species have been observed on this site.

**Little Blue Stem Opening (Parcel 76)** — This small, open area of less than an acre is located along the Matthew's Branch embayment. Little blue stem (*Schizachyrium scoparium*) dominates, with red cedars primarily restricted to the edges of the opening.

**Rocky Seepages (Parcels 15, 24, 26, 34, and 37)** — Extensive, rocky seepages were found at five locations on Tims Ford Reservoir Planning Parcels. These sites support unique and diverse plant and animal communities. These seepages are found within mid-age and mature woodlands, vary in slope, and continuously discharge water from fractured rock formations. The outcrops usually include both limestone and shale layers. One rocky seepage extends for about 100 feet along the reservoir shore. The other seepages are somewhat smaller. Jewel-weed (*Impatiens* sp.) is the characteristic plant of these areas with spice-bush (*Lindera benzoin*) often being present. A variety of bryophytes (mosses, liverworts), herbaceous plants, and woody plants occur at these sites. The exposed rock faces vary in wetness, generating a range of habitats for a diverse community of amphibians, small mammals, and invertebrates. These areas provide suitable habitat for four-toed salamanders (*Hemidactylium scutatum*), southeastern shrews and Allegheny woodrats. These sites are rare on Tims Ford Reservoir; however, similar habitats occur at nearby Short Springs State Natural Area.

**Shrub Communities (Parcels 41, 43, 47, and 75)** — The steepest shorelines, especially those with rock outcrops, are dominated by low-growing trees and shrubs including mountain laurel, hydrangea, ninebark, Virginia willow, and alder. These areas are quite scenic, particularly when the mountain laurel and hydrangea are blooming.

**Forested Riparian Corridors (Parcels 26, 34, 41, and 76)** — Riparian corridors are the interface between aquatic and terrestrial habitats. These areas are important habitats for a variety of animals. One corridor, found on Parcel 26 is located on an unnamed tributary of Turkey Creek. This corridor flows through a young- to mid-age deciduous woodland. The stream channel consists of exposed shale with a gravel/cobble substrate and includes a 15-foot high waterfall. Many moss-covered rotting logs line the banks. Both the vertical walls of the stream channel downstream of the falls and the sloped ridge immediately above the stream channel are similar in habitat description and diversity to the seepages described previously. A diverse community of amphibians, small mammals and invertebrates occupies these habitats. In addition, this wooded stream corridor is excellent foraging habitat for Indiana bats (*Myotis sodalis*), eastern big-eared bats (*Corynorhinus rafinesquii*), and eastern small-footed bats. A mid-age deciduous forest is located at the mouth of the unnamed tributary. This site holds moisture in the rich organic soil which creates cool, saturated conditions that provide habitat for species such as the four-toed salamander and southeastern shrew.

**Mature Deciduous Forest (Parcels 8, 14, 15, 24, 26, 33, 34, 37, 41, 42, 47, and 76)** — Much of the mid-age and mature deciduous forests remaining on Tims Ford Reservoir Lands Planning parcels are present only on sites that are too steep to easily log or develop. This type of habitat is extremely important to a variety of wildlife species. Large, uniform tracts of deciduous woodlands on Project land provide wintering habitat for bald eagles (*Haliaeetus leucocephalus*) and potential nesting habitat for bald eagles. Mature deciduous forests also provide important nesting sites for birds such as Cooper's hawks (*Accipiter cooperii*) and important travel corridors and nest sites for neotropical migratory birds. Older woodland sites often contain hollow trees such as American beech (*Fagus grandifolia*), as well as trees with sloughing bark including hickory (*Carya* sp.) and white oak (*Quercus alba*). These trees provide potential roosting habitat for many species of woodland bats, including the eastern big-eared bat, the eastern small-footed bat, and the endangered Indiana bat. Large stands of mature deciduous forests are rare on Tims Ford Reservoir, and the length of time necessary to regenerate these habitats makes protection of these forests critical. Most upland forested areas have been cleared or have been impacted by cattle. Historically this habitat type was wide-spread, but is now rarely encountered.

The state-listed plants and animals and uncommon habitats for the Tims Ford Lands Planning parcels are listed in Table H-4 (Appendix H).

### 3.5.1.2 SIGNIFICANT MANAGED AREAS

Mingo Swamp Wetland is approximately one mile south of parcel 41. It consists of two disjunct sections of land. Mingo Swamp is a large karst fen or swamp. It is managed by TWRA, Region II.

Tims Ford State Park is part of the original project land and is located within one mile of parcels 12, 14, 15, and 19. This park, owned and managed by the State of Tennessee, is geared toward fishing and water recreation. There are also biking and hiking trails.

Arnold Engineering Development Center (AEDC) Military Reservation is approximately one mile north of parcel 63. This large area is owned by the Department of Defense. Approximately 88 percent of the base is undeveloped and provides habitat for at least 68 species of plants or animals considered by the state or USFWS as endangered, threatened, or vulnerable.

### **3.5.2 ENVIRONMENTAL CONSEQUENCES**

Land-use practices, especially residential development, have already significantly altered the terrestrial ecological character of lands surrounding Tims Ford Reservoir. To date 1,493 acres of public lands have been sold for residential development (i.e., TERDA subdivisions). Large homes have been constructed and associated clearing activities for lawns, landscaping, views, road construction, and water-use facilities have affected approximately 35.3 miles of Tims Ford shoreline. An additional 17.1 miles of shoreline have been affected by the licensing of water-use facilities and associated vegetation clearing fronting private residential subdivisions. As a result, 52.4 miles of shoreline have been affected by residential development (19 percent of total shoreline). Clearing and alteration of shoreline vegetation can have direct impacts on both plant and animal species composition and abundance. Any alternative that includes additional residential development can negatively affect terrestrial ecology through:

1. Changes in species composition and structure of shoreline vegetation.
2. Increases in forest fragmentation and edge effects.
3. Increased human activity along shorelines.
4. Increased populations of predatory mammals and cowbird parasitism of nesting birds.
5. Reductions in lands available for natural resource conservation.
6. Reductions in the amount of public lands available for outdoor recreation opportunities.

#### **Alternative A**

Under this alternative, TVA and TDEC would manage their respective properties on a case-by-case basis. TVA would develop a land-use/land management plan for TVA-owned lands but it is unknown if TDEC would develop such a plan for lands under its control. Under Alternative A, rare terrestrial resources would be protected on 881 acres of project lands where sensitive resources have currently been identified to comply with state and federal laws. Also under this alternative, terrestrial resources would be protected on lands fronting existing residential development where sensitive resources have been identified to comply with TVA SMI commitments. Uncommon habitats and communities that do not contain sensitive species would not be protected under Alternative A. The 1,958 acres that did not meet "development criteria" would likely be managed similar to Zone 4 (Natural Resource Conservation). However, under this alternative, TVA and TDEC could consider requests for the use and disposition of 2,821 acres of land. The potential effects of this alternative would depend on the nature of land uses following the land disposition. Regardless, any development which results in significant changes in vegetative communities could negatively impact terrestrial resources.

#### **Alternative B**

This alternative calls for the disposition of 576 acres (13.8 shoreline miles) to Zone 6 (Recreation) and 938 acres (30.2 shoreline miles) to Zone 7 (Residential Development/Access). Potential impacts associated with recreational development resulting from Zone 6 allocations would depend on the nature and extent of that development. Recreation, including marinas, parking areas, cabins, campgrounds, and recreational vehicle (RV) parks, would have much greater potential impacts on terrestrial plant and animal communities than low-impact trail development and informal recreational use. By contrast, residential development (in Zone 7) would likely result in localized impacts to plant communities from clearing, construction, utility and infrastructure installation, and shoreline vegetation manipulation associated with water-use facilities. Additionally, most of the land meeting development criteria and allocated to Zone 7 has the highest natural resource management capability. These lands are currently in a combination of pasture/open lands, reverting fields, with scattered fence rows and woodlots. These uses create excellent

habitat for a variety of wildlife common to the area, including rabbits, quail, deer and turkey. These areas also have the greatest potential for active management because of the gentle relief and tillable soils.

TVA's SMI Vegetation Management Guidelines will be applied to all new residential development on Tims Ford reservoir. Implementation of these guidelines would reduce the impacts to wildlife and plant communities along the shoreline. Development and implementation of wildlife management plans on Zone 4 lands could reduce regional wildlife impacts associated with developmental activities, especially for game species. Under this alternative, all of the uncommon habitats/communities have been allocated to Zone 4 and would be protected. Terrestrial impacts associated with Alternative B would fall somewhere between alternatives C and D. Because most of the plant and animal communities affected are common in the area, the impacts of Alternative B are likely to be insignificant on a regional scale. However, when considered on a local scale, they may be significant.

#### **Alternative B1**

This alternative allows for minor land reallocations within Zones 4, 6, and 7 and the creation of a new Zone 8 (Conservation Partnership), in response to public comments. In comparison to Alternative B, Zone 4 shoreline has been reduced from 117.3 miles to 110.4 miles, but the acreage has increased from 3,605 acres to 3,692 acres. Zone 7 shoreline miles and acreage was also reduced slightly from 30.2 miles and 938 acres under Alternative B to 28.2 miles and 821 acres under this alternative. Most of this change is a result of reallocating Parcel 14 from Zone 7 to Zone 4 as a result of further analysis prompted by public comments. This reallocation results in the conservation of 118.6 more acres and 2.5 more miles of shoreline. However, the creation of the new Zone 8 could encourage residential development on some adjoining private lands. This could result in locally significant terrestrial impacts due to loss of habitat; however, regional impacts on common species would likely be insignificant.

Alternative B1 allocates 9 miles of shoreline and 33 acres of land to Zone 8 (Conservation Partnership), based on established criteria (see Appendix E). In general, these lands are narrow shoreline properties less than 50 feet in width and greater than 100 feet in length between the 895-foot contour and the adjoining private land. TVA would consider community based facilities within this zone if adjoining landowners would partner with TVA in the creation and protection of a wider shoreline buffer zone. This alternative could encourage more development on the backlying lands which could have negative impacts on the terrestrial resources. Residential development on these private lands could also result in impacts to uncommon habitats/communities and species that could reside in these areas.

It is difficult to determine the amount of residential development and associated impacts that could occur as a result of Zone 8. Based on available information, the average acreage of backlying subdivisions is 34 acres. Additionally, the average acreage of all existing subdivisions per shoreline mile is 50 acres. The largest privately-developed subdivision covers 82.2 acres and the smallest 4.2 acres. As currently proposed, 51 parcels, consisting of nine shoreline miles have been allocated to Zone 8 which could support 58 community facilities under the proposed guidelines. Assuming a 34-acre private subdivision per Zone 8 parcel, conversion of approximately 1,734 acres of mixed open land and forest land to residential development could occur. A more conservative estimate, assumes a 50-acre per shoreline mile, and projects a conversion of approximately 450 acres that could occur. Although the creation of Zone 8 could facilitate some of this development, much of it could occur whether or not this land was allocated to Zone 8. Likewise some development has already occurred behind Zone 8 lands and is included in these estimated acreages.

Adjoining undeveloped lands are predominantly a mixture of open lands (hay, pasture, reverting fields) and hardwood forest (see Affected Environment description under section 3.5.1). Generally open land occurs along ridgetops and along gentle to moderate slopes. Forested lands typically occur on steeper slopes within drainage areas, along shoreline areas, and in scattered woodlots. These areas currently provide suitable habitat for a diverse assemblage of plant and animal species and are capable of supporting more wildlife than project lands because of habitat quality (better soils, more tillable land, gentle topography, etc.), quantity, and juxtaposition of the various habitat components. Species utilization of this habitat is described under Section 3.5.1.

There would be some minor loss of terrestrial habitat as a result of the construction of launching ramps and the establishment of 20-foot access corridors in Zone 8 parcels. These impacts would be minimized during the 26a review process by determining the appropriate size of community facilities not to exceed 2,000 square feet, carefully selecting the location of the access corridor and facilities, and implementation of SMP measures.

### **Alternative C**

Under this alternative, essentially all lands suitable for development would be developed. The exception would be those areas having sensitive resources that are protected by state or federal laws. As discussed previously, potential impacts associated with disposition of lands under Zone 6 would depend on the type and level of recreation development that would occur. The impacts of residential development (in Zone 7) would be significantly greater than those occurring under Alternative B because an additional 1,647 acres of public land would be made available for residential development. Under Alternative C, a total of 2,585 acres of public land (64.9 shoreline miles) would be made available for residential use. Alteration of vegetation on 64.9 miles of shoreline, even under SMI guidelines, could result in significant changes to the abundance and richness of plant and animal species. None of the uncommon habitats/communities would be protected under this alternative.

### **Alternative D**

This alternative provides the greatest degree of protection and potential management for terrestrial species because no additional public land would be made available for residential development. The amount of land made available under Zone 6 (Recreation), would also be reduced. Adoption of this alternative would protect terrestrial species under Zone 3 lands where state- or federally-protected species occur and on all remaining lands allocated to Zone 4. Under this alternative, 881 acres would be allocated to Zone 3 (Sensitive Resource Protection) and 4,779 acres allocated to Zone 4 (Natural Resource Conservation). This alternative would benefit wildlife and plant communities by eliminating future residential and recreational development options on Tims Ford Lands. As a result, forested shoreline riparian zones would remain intact, and large upland tracts having a diversity of habitat types could be actively managed for wildlife and other natural resources to meet the growing demand for outdoor recreational experiences.

### **Summary**

Adoption of Alternative D would provide the greatest protection for terrestrial resources followed by Alternatives B, B1, A, and C. Alternative B is a compromise but has the potential to impact the terrestrial resources on 1,174 acres of public land and 20.4 miles of riparian shoreline. Impacts associated with Alternative B could be reduced by restricting home size and having stricter standards for vegetation management than are currently required under TVA SMI vegetation management guidelines. Impacts associated with development under any of the alternatives would likely be significant on a local and subregional scale, but at the regional landscape level would likely be insignificant, at least for commonly occurring species and habitats.

Potential impacts on planned lands under Alternative B1 are similar to those under Alternative B. The creation of the new Zone 8 would impact terrestrial resources and likely encourage residential development on some adjoining private lands. This could result in locally significant terrestrial impacts due to loss of habitat; however, regional impacts on common species would likely be insignificant. In order to reduce and/or minimize the impacts of Zone 8, several mitigative measures could be implemented. These would include increasing the width of the conservation partnership easement, implementing stronger vegetation management guidelines, and allowing fewer and smaller community facilities. Adoption of these mitigative measures would not prevent impacts on terrestrial resources, but may protect some unique or uncommon communities in a wider buffer zone. The key to protecting the integrity of the shoreline and obtaining support for a Zone 8 approach will be adequate enforcement of the conservation partnership easement provisions.

### 3.6 THREATENED AND ENDANGERED SPECIES (T&E)

#### 3.6.1 AFFECTED ENVIRONMENT

##### 3.6.1.1 TERRESTRIAL ANIMALS

The various types of plant communities found on Tims Ford Land Planning Parcels provide suitable habitat for a variety of federal- and state-listed terrestrial animals listed by the USFWS or State of Tennessee as endangered, threatened, or in need of management. These communities are quite diverse including habitats such as upland hardwoods, bottomland hardwoods, wetlands, open-field, and agricultural habitats. In addition, many parcels contain features such as seepages, woodland ponds, and rock outcrops that often provide unique habitats for many rare animals and plants. While not all of these rare species are officially listed, they and the unique habitats they occupy are important in maintaining the biodiversity of the Tims Ford area.

Prior to initiating surveys on Tims Ford Project lands, TVA Regional Natural Heritage Project databases and Tennessee Natural Heritage databases were reviewed to obtain records for federal- or state-listed terrestrial animals in the vicinity of Project lands adjacent to Tims Ford Reservoir. No records of listed terrestrial animals were reported from Tims Ford Reservoir Lands Planning Parcels. However, records of 18 listed terrestrial animal species were identified from Franklin and Moore Counties; these species, and their state and federal status, are listed in Table 3.6-1. Of these species, only the gray bat and the bald eagle were reported in the reservoir area.

**Table 3.6-1 Listed Terrestrial Animal Species Known from Franklin and Moore Counties**

Common Name	Scientific Name	State Status	Federal Status
Gray bat	<i>Myotis grisescens</i>	Endangered	Endangered
Indiana bat	<i>Myotis sodalis</i>	Endangered	Endangered
Eastern big-eared bat	<i>Corynorhinus rafinesquii</i>	NMGT <sup>1</sup>	-
Allegheny woodrat	<i>Neotoma magister</i>	NMGT	-
Southeastern shrew	<i>Sorex longirostris</i>	NMGT	-
Smoky shrew	<i>Sorex fumeus</i>	NMGT	-
Bachman's sparrow	<i>Aimophila aestivalis</i>	Endangered	-
Sharp-shinned hawk	<i>Accipiter striatus</i>	NMGT	-
Grasshopper sparrow	<i>Ammodramus savannarum</i>	NMGT	-
Bald eagle	<i>Haliaeetus leucocephalus</i>	Threatened	Threatened <sup>2</sup>
Osprey	<i>Pandion Haliaeetus</i>	Threatened	Fairly Common
Least bittern	<i>Ixobrychus exilis</i>	NMGT	-
Northern pine snake	<i>Pituophis m. melanoleucus</i>	Threatened	-
Green anole	<i>Anolis carolinensis</i>	NMGT	-
Eastern slender glass lizard	<i>Ophisaurus attenuatus longicaudus</i>	NMGT	-
Tennessee cave salamander	<i>Gyrinophilus pallescens</i>	Threatened	-
Mole salamander	<i>Ambystoma talpoideum</i>	NMGT	-
Four-toed salamander	<i>Hemidactylium scutatum</i>	NMGT	-
Barking treefrog	<i>Hyla gratiosa</i>	NMGT	-

1: NMGT: Deemed in need of management by TWRA.

2: Proposed on July 6, 1999 for removal from List of Endangered and Threatened Wildlife.

Field investigations were initiated on parcels during the summer of 1998. Special emphasis was placed upon finding populations of federal- and state-listed animals on each parcel. Suitable habitat for two of the 18 species, the smoky shrew and the Tennessee cave salamander, does not occur on Tims Ford Reservoir Lands. Of the remaining 16 potentially occurring listed species, six were found during field surveys.

The southeastern shrew appears to occur in a variety of habitats at Tims Ford Reservoir. Specimens were captured at two sites at Parcel 63 (bottomland hardwood forest) and one site at parcel 44 (dry, open field). Southeastern shrew populations are not well understood and these occurrences are important. Suitable habitat for this species exists on several other parcels of Project lands.

Mole salamanders were found at two sites in Parcel 63. The many seasonally flooded woodland depressions in this bottomland hardwood forest provide critical breeding areas for this and many other woodland salamanders. Of all the parcels that were surveyed, only parcel 63 contained this type of habitat.

A few bald eagles are present during the winter on Tims Ford Reservoir. Bald eagles feed primarily on fish which they catch live or scavenge from the reservoir surface or shoreline areas with relatively low levels of human activity. Wintering birds usually roost on sheltered, wooded slopes near the reservoir. No eagles presently nest on Tims Ford. Suitable nesting habitat does exist on Tims Ford Project lands and it is possible that eagles will nest on Tims Ford in the future.

The osprey is a fairly common spring and fall migrant in the area, and much of the reservoir provides suitable feeding habitat. Suitable nesting habitat, in the form of large trees adjacent to the water, is also fairly common on Tims Ford Reservoir. However, no nesting records are known from this area. Ospreys are often fairly tolerant of human activity.

Great egrets, listed as in need of management in Tennessee, were observed foraging on several occasions in wetland areas of Parcel 63. Shoreline areas elsewhere on the reservoir also provide suitable foraging habitat. Suitable nesting habitat does exist on Tims Ford Project land; however, no nesting colonies are known to exist in the immediate vicinity. The nearest major heron colony is located at nearby Arnold Engineering and Development Center. Great egrets are not known to nest there.

Double-crested cormorants, listed as in need of management in Tennessee, were observed near Parcels 63 and 37. These birds were likely transients or non-breeding summer residents. None are known to nest on or near Tims Ford Reservoir. Cormorants are quite common in much of the southeast, especially during the winter, and its listing as in need of management in Tennessee is primarily intended to protect the few nesting colonies in the state.

Mist-net surveys were conducted for gray and Indiana bats at Parcel 63. The Elk River has a well-established riparian zone and long stretches of open water which are typically used as foraging areas by gray bats. The extensive bottomland hardwood forest on Parcel 63 contains numerous hollow trees and several areas with an open midstory, providing typical roosting and foraging areas for Indiana bats. These habitats represented the best suitable habitat for either species on the Tims Ford Lands Planning Parcels. To survey for gray and Indiana bats, TVA biologists placed nets over the Elk River and in the bottomland hardwood forest. Neither species was captured. However, eastern red bats (*Lasiurus borealis*) and eastern pipistrelles (*Pipistrellus subflavus*) were captured. These species are common in the southeast and are not listed by USFWS or the State of Tennessee.

Caves in the reservoir area were also examined for bats. Gray bats have been reported to roost in Pennington Cave during summer months. However, none were found during TVA surveys using harp traps and bat detectors in 1996, 1997, and 1998. The only bat species captured was the eastern pipistrelles. Pennington Cave and Devil's Den Cave were also surveyed during the winter of 1998 for hibernating populations of Indiana bats. No bats were found in either cave during surveys.

Although no gray bats or Indiana bats were captured during surveys, suitable habitat exists for these species on Tims Ford Reservoir. Gray bats from the nearby Woods Dam colony may forage over Tims Ford Reservoir. Due to the presence of many hollow trees in the bottomland hardwood forest in Parcel 63, small colonies of Indiana bats may exist there. Several smaller tracts of hardwood forests were also identified as potential roosting and foraging habitat for Indiana bats.



Except for the mole salamander and the southeastern shrew, no new populations of listed animal species were found. However, suitable habitat for these and other listed species exists on Tims Ford Lands Planning Parcels. These species, their federal and state status, and an indicator of the relative abundance of their suitable habitat are listed in Table 3.6-2.

**Table 3.6-2 State- and Federally-Listed Terrestrial Animal Species Potentially Present on Lands Planning Parcels Due to the Presence of Suitable Habitat**

Common Name	Scientific Name	State Status	Federal Status	Relative Abundance of Suitable Habitat
Gray bat	<i>Myotis grisescens</i>	Endangered	Endangered	Very Common <sup>1</sup>
Indiana bat	<i>Myotis sodalis</i>	Endangered	Endangered	Common <sup>1</sup>
River otter	<i>Lutra canadensis</i>	Threatened	-	Very Common
Eastern big-eared bat	<i>Corynorhinus rafinesquii</i>	NMGT <sup>2</sup>	-	Common
Eastern small-footed bat	<i>Myotis leibii</i>	NMGT	-	Common
Allegheny woodrat	<i>Neotoma magister</i>	NMGT	-	Fairly Common
Meadow jumping mouse	<i>Zapus hudsonius</i>	NMGT	-	Fairly Common
Bald eagle	<i>Haliaeetus leucocephalus</i>	Threatened	Threatened	Fairly Common
Bachman's sparrow	<i>Aimophila aestivalis</i>	Endangered	-	Common
Lark sparrow	<i>Chondestes grammacus</i>	Threatened	-	Rare
Bewick's wren	<i>Thryomanes bewickii bewickii</i>	Threatened	-	Common
Osprey	<i>Pandion haliaetus</i>	Threatened	-	Fairly Common
Great egret	<i>Casmerodius albus</i>	NMGT	-	Rare
Double-crested cormorant	<i>Phalacrocorax auritus</i>	NMGT	-	Fairly Common
Little blue heron	<i>Egretta caerulea</i>	NMGT	-	Rare
Snowy egret	<i>Egretta thula</i>	NMGT	-	Rare
Least bittern	<i>Ixobrychus exilis</i>	NMGT	-	Rare
King rail	<i>Rallus elegans</i>	NMGT	-	Rare
Cooper's hawk	<i>Accipiter cooperii</i>	NMGT	-	Very Common
Sharp-shinned hawk	<i>Accipiter striatus</i>	NMGT	-	Uncommon
Grasshopper sparrow	<i>Ammodramus savannarum</i>	NMGT	-	Common
Common barn-owl	<i>Tyto alba</i>	NMGT	-	Fairly Common
Northern harrier	<i>Circus cyaneus</i>	NMGT	-	Fairly Common
Northern pine snake	<i>Pituophis m. melanoleucus</i>	Threatened	-	Rare
Eastern slender glass lizard	<i>Ophisaurus attenuatus longicaudus</i>	NMGT	-	Uncommon
Eastern hellbender	<i>Cryptobranchus a. alleganiensis</i>	NMGT	-	Rare
Four-toed salamander	<i>Hemidactylium scutatum</i>	NMGT	-	Common
Barking treefrog	<i>Hyla gratiosa</i>	NMGT	-	Rare

<sup>1</sup> - Refers only to suitable foraging habitat. Suitable roost/breeding habitat for the gray bat is rare, and for the Indiana bat, uncommon.

<sup>2</sup> - NMGT - Deemed in need of management by TWRA

### 3.6.1.2 AQUATIC ANIMALS

Prior to the construction of Tims Ford Reservoir, several kinds of freshwater mussels and, probably, some fishes now listed as endangered or threatened species on either the federal or state level lived in this reach of the Elk River (Isom, et al., 1973; Etnier and Starnes, 1993). These are listed in Table 3.6-3. The flowing-water habitats in which those species lived have been replaced with the standing-water habitats and, as a result, the listed species no longer occur in this area. A fish species considered in need of management in Tennessee, the flame chub (*Hemitrema flammea*), occurs in this region of the state and might exist in extremely small, spring-fed streams which persist in the project area.

A few of the endangered mussels in Table 3.6-3, as well as the boulder darter (*Etheostoma wapiti*), federally listed as endangered, survive in the Elk River downstream of Tims Ford Dam. None of these species occur within at least 15 river miles of the dam.

**Table 3.6-3 State- and Federally-Listed Aquatic Animal Species Historically Known from the Pool Area of Tims Ford Reservoir Prior to Reservoir Construction**

Common Name	Scientific Name	Habitat	State Status	Federal Status
Yellow-blossom pearlymussel	<i>Epioblasma florentina florentina</i> *	Sand & gravel shoals of small to large rivers	Endangered	Endangered
Turgid blossom pearlymussel	<i>Epioblasma turgidula</i> *	Sand & gravel shoals of small rivers	Endangered	Endangered
Shiny pigtoe	<i>Fusconaia cor</i>	Sand & gravel shoals of small to medium rivers	Endangered	Endangered
Fine-rayed pigtoe	<i>Fusconaia cuneolus</i>	Sand & gravel shoals of small to large rivers	Endangered	Endangered
Cumberland monkeyface	<i>Quadrula intermedia</i>	Sand & gravel shoals of medium to large rivers	Endangered	Endangered
Pale lilliput	<i>Toxolasma cylindrellus</i>	Shallow, sandy, gravely areas in small tributary streams	Endangered	Endangered
Flame Chub	<i>Hemitrema flammea</i>	Small, spring-fed vegetated streams	NGMT**	-

\*Believed to be extinct

\*\* NMGT - Deemed in need of management by TWRA

### 3.6.1.3 PLANTS

Prior to the field inventory carried out as part of this land planning effort, no state or federally listed plants were known from project lands adjacent to the reservoir. Numerous listed species, however, have been reported from elsewhere in the Eastern Highland Rim physiographic province, including Moore and Franklin Counties. Listed plants known from the two project area counties are given in Table 3.6-4. This list was compiled from records in databases maintained by the TVA Regional Heritage Project and the Tennessee Natural Heritage Program. Franklin County has long been known for the presence of a large number of rare plants, most of which are concentrated in remnant grassland and/or savannah habitats northeast of the reservoir.

**Table 3.6-4 State- and Federally-Listed Plants Known from Franklin and Moore Counties**

<b>Common Name</b>	<b>Scientific Name</b>	<b>State Status</b>	<b>Federal Status</b>
Eggert's sunflower	<i>Helianthus eggertii</i>	Threatened	Threatened
Shinners' false-foxglove	<i>Agalinis pseudaphylla</i>	Endangered	-
Velvety sedge	<i>Carex vestita</i>	Endangered	-
Pink lady's-slipper	<i>Cypripedium acaule</i>	Endangered	-
Horse-tail spike-rush	<i>Eleocharis equisetoides</i>	Endangered	-
Southern lady's-slipper	<i>Cypripedium kentuckiense</i>	Endangered	-
White prairie-clover	<i>Dalea candida</i>	Endangered	-
Small's stonecrop	<i>Diamorpha smallii</i>	Endangered	-
Harper's fimbristylis	<i>Fimbristylis perpusilla</i>	Endangered	-
Florida Hedge-hyssop	<i>Gratiola floridana</i>	Endangered	-
Ozark bunchflower	<i>Melanthium woodii</i>	Endangered	-
Smooth false gromwell	<i>Onosmodium molle</i> ssp. <i>Subsetosum</i>	Endangered	-
Dwarf sundew	<i>Drosera brevifolia</i>	Threatened	-
Pale purple-coneflower	<i>Echinacea pallida</i>	Threatened	-
Dwarf huckleberry	<i>Gaylussacia dumosa</i>	Threatened	-
Canada lily	<i>Lilium canadense</i>	Threatened	-
Canby's lobelia	<i>Lobelia canbyi</i>	Threatened	-
Globe-fruited false-loosestrife	<i>Ludwigia sphaeocarpa</i>	Threatened	-
Broad-leaved Barbara's - buttons	<i>Marshallia trinervia</i>	Threatened	-
Cutleaf water-milfoil	<i>Myriophyllum pinnatum</i>	Threatened	-
Alabama snow-wreath	<i>Neviusia alabamensis</i>	Threatened	-
Prairie milkweed	<i>Asclepias hirtella</i>	Special Concern	-
American smoketree	<i>Cotinus obovatus</i>	Special Concern	-
Cluster fescue	<i>Festuca paradoxa</i>	Special Concern	-
Sharp-scaled mannagrass	<i>Glyceria acutiflora</i>	Special Concern	-
Goldenseal	<i>Hydrastis canadensis</i>	Special Concern	-
Ovate fiddleleaf	<i>Hydrolea ovata</i>	Special Concern	-
Mountain honeysuckle	<i>Lonicera dioica</i>	Special Concern	-
American ginseng	<i>Panax quinquefolius</i>	Special Concern	-

Field surveys on Project land for listed plants were conducted from July, 1998, through March, 1999. Prior to initiating these surveys, the habitat requirements for potentially occurring listed plants were reviewed, and botanists from the Tennessee Native Plant Society and Arnold Engineering and Development Center were also consulted.

A total of 12 occurrences of five state-listed species were found on six parcels in the study area. One other occurrence of a listed species was found along the reservoir at an existing subdivision. These findings are described in more detail below. No federally-listed plant species were found.

#### **Listed Plant Species**

Spreading false-foxglove (*Aureolaria patula*), state-listed as threatened and occurring in only four states, was found along both sides of the upper section of the reservoir in sandy soils and on rocky ledges. These occurrences in Parcel 63 are an important range extension of this species. A second site for this species was found on a cliff along the reservoir at an existing subdivision.

A single fruit-producing butternut (*Juglans cinerea*) was discovered on the reservoir shore on Parcel 78; this plant is listed by the state as threatened. Butternuts are declining throughout their range due to a disease, butternut canker. The single tree at the site produced nuts in 1998 but had many dead branches which may indicate the presence of butternut canker disease. There are also a few butternut trees on Tims Ford State Park land.

Southern rein-orchid (*Platanthera flava* var. *flava*), a plant of special concern in Tennessee, was found at three sites in a low forested wetland in parcel 63 at the upper end of the reservoir. About 500 plants grew at one of the sites.

American ginseng was identified in five parcels and may occur in additional areas of ungrazed bottomlands. Trade in American ginseng is federally controlled, and the Tennessee Division of Natural Heritage lists ginseng as of special concern due to potential for over-harvesting. State regulations prohibit ginseng harvesting from most state lands and require the landowner's permission to harvest ginseng from other lands. The presence of ginseng on Tims Ford lands was expected based on its occurrence in nearby areas.

Ramps (*Allium* sp.), listed as a special concern due to commercial exploitation, were found in several scattered clusters at one site in a moist, deciduous forest. The state list recognizes two species of ramps, *Allium burdickii* and *Allium tricoccum*. It is not known which species is found at the Tims Ford site, and both species are uncommon in the surrounding area.

### **3.6.2 ENVIRONMENTAL CONSEQUENCES**

During field inventories conducted to support this planning effort, populations of state-listed plant or animal species were found on six of the plan parcels. An additional state-listed plant population (spreading false foxglove) was found on a tract of land previously committed for residential access. This tract was placed in the Residential Mitigation category during the shoreline categorization process (see Section 2.1.1). The approval of any new water-use facility or vegetation management on TVA land at this site is therefore dependent on the avoidance or mitigation of potential impacts to the false foxglove. This is required regardless of which alternative is selected.

On Parcel 76, a locally significant presence of Little Bluestem is located along the embayment of Matthew Branch. Future uses of this parcel will be delineated through the TDEC's Strategic Management Plan for Tims Ford State Park. It is not likely that the TDEC state park management plan would significantly impact this species.

None of the alternatives would affect endangered fish or mussels, in part because they no longer exist in the area. In addition, no endangered fish or mussels occurring in the Elk River downstream of Tims Ford would be affected. The flame chub, listed as in need of management in Tennessee, may occur in small streams in the project area.

Under all alternatives, two of the tracts (15 and 63) supporting state-listed plants and permanent resident terrestrial animals would be allocated to Zone 3 (Sensitive Resource Management) or a similar preservation-oriented use. This would provide long-term habitat protection for populations of four listed plants, the southeastern shrew, and the mole salamander. It would also protect suitable habitat for some state-listed wetland birds and suitable summer roost and foraging habitat for the federally listed Indiana bat. However, the long-term viability of one of the listed plants (butternut) is questionable because of disease.

The alternatives differ greatly in their potential impacts on other listed species and suitable habitat for listed species. These differences are described below in more detail.

#### **Alternative A**

Under Alternative A, two parcels on which state-listed species reside, parcels 15 and 63, would be managed for protection sensitive resources. These two tracts, as well as some of the other tracts likely to be similarly managed, also provide suitable habitat for the bald eagle, the gray and Indiana bats, and

some state-listed species potentially living in the area. Portions of two other parcels supporting state-listed plants are likely to be managed for Natural Resource Conservation. Protection and, if necessary, active management of the listed plants would be a high priority on these two parcels. Two other parcels supporting state-listed species, parcels 24 and 44, would likely be designated for potential development.

Alternative A would provide for the protection and management of some populations of state-listed species. At least two populations of state-listed species could be impacted because of the projected allocation of their parcels to potential development. One of these species is listed because of concerns over excessive harvesting. The other species is fairly widespread, but poorly known. Other tracts likely to be developed provide suitable habitat for listed species. While this alternative would likely result in the loss of some suitable foraging habitat for federally-listed species, it would not likely have detrimental effects on their current populations. Future residential development of parcels would limit the future growth of populations of some listed species, and, through fragmentation, edge effects, and introduction of invasive exotic species, could affect some populations on sensitive resource management and natural resource conservation parcels. Compared to the other alternatives, Alternative A would likely result in the second highest level of impacts to listed plants and animals. These impacts would likely be insignificant and would not result in the loss of any species from the region. The regional population growth and recovery of some species, however, could be slower than under some other alternatives.

#### **Alternative B**

Under Alternative B, two parcels on which state-listed species live, parcels 15 and 63, would be allocated for Zone 3 (Sensitive Resource Management). The other four parcels on which state-listed species live (8, 24, 37, 44) are allocated for Zone 4 (Natural Resource Conservation). Protection and, if necessary, active management of the listed plants would be a high priority on these four parcels. The six tracts on which state-listed species occur, as well as some of the other tracts allocated for Sensitive Resource Management and Natural Resource Conservation, also provide suitable habitat for the bald eagle, the gray and Indiana bats, and some state-listed species potentially residing in the area.

A few parcels (e.g., 14, 76) allocated for Recreation or Residential Development contain high quality forested habitats suitable for use by some sensitive species. Parcel 76 also contains other ecologically important plant communities. While it may be possible to develop portions of these tracts without directly impacting the important habitats, the long term viability of these habitats and species on the tracts would be uncertain.

While Alternative B would likely result in the loss of some suitable foraging habitat for federally listed species, it would not likely have detrimental effects on their current populations. Development of some of the parcels would limit the future growth of populations of some listed species, and, through fragmentation, edge effects, and introduction of invasive exotic species, could affect some populations on Zone 3 (Sensitive Resource Management) and Zone 4 (Natural Resource Conservation) parcels. Compared to the other alternatives, Alternative B would likely result in the second lowest level of impacts to listed plants and animals. These impacts would, however, likely be insignificant and would not result in the loss of any species from the region.

#### **Alternative B1**

Under Alternative B, two parcels on which state-listed species live, parcels 15 and 63, would be allocated for Zone 3 (Sensitive Resource Management). The other four parcels on which state-listed species live (8, 24, 37, 44) are allocated for Zone 4 (Natural Resource Conservation). Protection and, if necessary, active management of the listed plants would be a high priority on these four parcels. The six tracts on which state-listed species occur, as well as some of the other tracts allocated for Sensitive Resource Management and Natural Resource Conservation, also provide suitable habitat for the bald eagle, the gray and Indiana bats, and some state-listed species potentially residing in the area.

Under Alternative B1, Parcel 76 which is allocated for Recreation contains high quality forested habitats suitable for use by some sensitive species. Parcel 76 contains other ecologically important plant communities. While it may be possible to develop portions of this parcel without directly impacting the important habitats, the long term viability of these habitats and species on the tracts would be uncertain.

Alternative B1 also includes the new Zone 8 regarded as a conservation partnership zone. The concept to increase protection of these areas by increasing the buffer through acquisition of easements from private landowners is sound but could nonetheless have a potential indirect impact on the threatened and endangered species habitat on adjoining private lands that may be disturbed due to development. Increased buffers should improve water quality, decrease erosion, and enhance the fish habitat with proper management, but increases in wildlife is doubtful in a narrow strip targeted for use as a community water-use facility.

These zones and associated community water-use facilities (if permitted) present a complex set of problems and challenges in terms of management and oversight. To reach the stated goals of decreased erosion, improvements in water quality and habitat management will be required. If these zones are adjacent to open fields, planting and maintenance of cover types, targeted for these goals, will be required with over sight to limit and monitor activity within the conservation zones. Community water-use facilities placed adjacent to mature, forested lands provide public access and increase the likelihood of indirect impacts of development on adjoining lands. This development has the potential to impact unknown threatened and endangered species' habitat through disturbance. During each application for a community facility, a site-specific environmental review at the appropriate level would be conducted to include a review of indirect impacts on Threatened and Endangered species.

### **Alternative C**

Alternative C would allocate parcels containing state-listed species to the similar non-development categories as would likely occur under Alternative A. Parcels 15 and 63 would be allocated to Sensitive Resource Management, and portions of two other parcels, 8 and 37, would be allocated to Natural Resource Conservation. Protection and, if necessary, active management of the listed plants would be a high priority on these two parcels. The remainder of parcels 8 and 37, as well as two other parcels supporting state-listed species, parcels 24 and 44, would be allocated for Residential Development. The long-term survival of the listed species following residential development is unlikely. Some of the other tracts allocated for Sensitive Resource Management and Natural Resource Conservation also provide suitable habitat for the bald eagle, the gray and Indiana bats, and some state-listed species potentially residing in the area.

A few parcels (e.g., 14, 42, 76) allocated for Recreational or Residential Development contain high quality forested habitats suitable for use by some state- and federally- listed species. Parcel 76 also contains other ecologically important plant communities. While it may be possible to develop portions of these tracts without directly impacting the important habitats, their long term viability would be uncertain. Development of some parcels would also limit the future growth of populations of some listed species, and, through fragmentation, edge effects, and introduction of invasive exotic species, could affect some populations on Sensitive Resource Management and Natural Resource Conservation parcels.

Alternative C does protect some of the parcels providing suitable habitat for the federally listed bald eagle, gray bat, and Indiana bat; negative impacts on current populations of these species are unlikely. Several other parcels allocated to Residential Development also contain suitable habitat for these species and their development could slow the regional recovery of these species. Compared to the other alternatives, Alternative C would likely result in the highest level of impacts on listed plants and animals. A few local populations of state-listed species would likely be extirpated, resulting in locally significant impacts.

### **Alternative D**

Alternative D, in comparison to the other alternatives, would allocate the greatest area to Zone 3 (Sensitive Resource Management) and to Zone 4 (Natural Resource Conservation). All of the parcels on which populations of state-listed species are known to occur would be allocated to Sensitive Resource Management or Natural Resource Conservation, where protection and, if necessary, active management of listed species would be a high priority. Most of the tracts containing suitable habitat for state- and federally- listed species and all of the tracts identified as containing uncommon or unique habitats would remain undeveloped. Because of the limited area available for development, the detrimental impacts from fragmentation, edge effects, and introduction of invasive exotic species would be minimized, and, over the

long term, habitat fragmentation could be reduced from present levels. Alternative D would consequently result in the lowest level of negative impacts on listed species and would likely enhance the regional recovery of some species.

### **3.7 WETLANDS**

#### **3.7.1 AFFECTED ENVIRONMENT**

Executive Order 11990 (Protection of Wetlands) directs federal agencies to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands. In addition, activities in wetlands are regulated under the authority of the Federal Clean Water Act and the Tennessee Water Quality Control Act of 1977.

Wetlands are defined under the U.S. Army Corps of Engineers' regulations implementing Section 404 of the CWA as:

"Those areas inundated by surface or groundwater with a frequency sufficient to support, and under normal circumstance, do or would support a prevalence of vegetation or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs, and similar areas such as sloughs, potholes, wet meadows, mud flats, and natural ponds."

Identification of wetlands in the field followed the USACE (1987) criteria. The wetlands have been classified according to the system developed by Cowardin et al. (1979) for the classification of wetlands and deep-water habitats. The wetlands have also been classified according to their hydrogeomorphic (HGM) properties. The hydrogeomorphic classification groups together wetlands that have similar functions as a result of their geomorphic setting, water source, and hydrodynamics (Brinson 1993).

The wetlands identified in the Tims Ford land management parcels during the 1998-99 surveys are in the Palustrine system (P), the forested (FO), scrub-shrub (SS), and emergent (EM) subsystems. In the FO and SS wetlands, the vegetation class is "broad-leaved deciduous", which is designated by the number 1. In the emergent wetlands, the vegetation class is "persistent", designated by the number 1, and "non-persistent", designated by the number 2. The term "persistent" refers to herbaceous vegetation with aboveground parts that persist through the non-growing season such as the dry remains of cattail and sedges. "Non-persistent" vegetation dies back completely to ground level during the non-growing season. The hydrologic regimes in these wetlands were judged to include temporarily flooded (A) and seasonally flooded (C) lands, although it is possible that other hydrologic regimes such as saturated (B) and semi-permanently flooded (F) lands occur, especially in parcel 63.

The HGM classes of wetlands in and adjacent to the Tims Ford Reservoir are riverine and lacustrine fringe. Riverine wetlands are located in a floodplain or riparian geomorphic setting. Lacustrine fringe wetlands occur on the shallow margins of reservoirs. The functions of lacustrine fringe wetlands include shoreline stabilization, retention of sediments, removal or transformation of contaminants, nutrient cycling, provision of fish and wildlife habitat, and provision of plant species and community diversity. The functions of riverine wetlands include all of the above plus functions related to floodflow alterations.

The following is a brief description of the wetland functions identified along the Tims Ford Reservoir.

**Shoreline stabilization:** The roots of trees, shrubs, and herbaceous vegetation, and the organic litter layer on the ground help to stabilize the shoreline soil against erosion that could result from boat wakes and storm runoff. This function is important throughout the reservoir, but is particularly important in preserving those areas along the main shoreline subject to wave action from boat wakes and increased runoff from developed areas.

**Retention of sediments:** Vegetation and the litter layer in the wetlands aid in the removal and retention of eroded soil and particulates that wash toward the reservoir from adjacent upland areas and in tributary

streams. This function is particularly important in preserving those areas in which surrounding land uses could result in increased erosion and runoff, including farming operations and land development.

**Retention and transformation of contaminants and nutrients:** Contaminants and nutrients in dissolved and particulate form can be carried into the reservoir in storm runoff. Potential contaminants could include fertilizers and pesticides from agricultural, residential, and urban areas; excess nutrients and pathogenic bacteria from animal waste and septic system leachate; and oil and grease from roads and watercraft. Through various chemical, biological, and physical means in wetland soils, these contaminants and nutrients can be sequestered, transformed into other chemical form, or assimilated by plants. For instance, nitrate-nitrogen is assimilated by plants, and oil and grease may be eventually broken down by naturally-occurring microorganisms. However, the ability of wetlands to perform this function can be overwhelmed if the capacity of the wetland to retain or transform these contaminants is exceeded. This function should not be used as a substitute for controlling the contaminants at their source.

**Nutrient cycling:** Nutrients are contributed to the system internally in leaf litter, plant debris, and animal waste and remains. These nutrients are cycled internally and either taken up by plants in the wetland or exported out of the wetland.

**Provision of fish and wildlife habitat:** Wetlands provide habitat for a large number of mammal, bird, amphibian, reptile, fish, and invertebrate species. Wetlands are essential habitat for migratory and nesting waterfowl and many shorebird and songbird species. Many species are wetland-dependent for a part or all of their life cycle. Other species may not use the wetlands directly, but are dependent on wetlands as a source of carbon and energy. An example of this would be aquatic invertebrates which use the organic material exported from wetlands.

**Provision of plant species and community diversity:** Wetland plant communities consist primarily of species that can grow under low- oxygen, saturated- soil conditions. Although some of the species can grow outside of wetlands, most cannot grow in dry situations. The destruction of wetlands results in local removal of commonly occurring species from the landscape, and thus, over time, can lead to a reduction in the amount of plant, community, and landscape diversity in the local area or region. Wetlands are also habitat for several of state- or federally-listed plant species that are unable to grow under non-wetland conditions.

**Floodflow alteration:** Important functions of riverine wetlands are those associated with floodflow alteration. These functions include short- and long- term storage of flood waters and energy reduction. This function is also important for another wetland function, the export of organic carbon. Plant and other organic material produced in the wetland is exported out of the wetland to downstream consumers during flood events. The qualitative determination of actual or potential wetland function was based on wetland location, hydrologic regime, nearby land uses and disturbances, estimated size of the wetland, and vegetation density and community structure.

Wetlands were identified on 20 of the parcels (8, 15, 24, 26, 28-1, 31, 33, 37, 40, 41, 51, 53, 63, 67, 70, 72, 78, 79, 79A, and 80). With the exception of wetlands in parcel 63 north of Beth Page Road, most of the wetlands identified are located wholly or partially below the 895' contour. Information for each wetland identified during the field survey is presented in Table H-5 in Appendix H.

Excluding the large wetland complex on parcel 63, a total of 41 wetlands were identified. Three of these wetland areas are indicated on Table H-3 (Appendix H) in two sections each (8-2 and 8-3; 51-1 and 51-2; 53-1 and 53-2) to differentiate between the FO and SS portions of the wetland, but they are considered to be three contiguous wetland areas rather than six separate wetlands.

Thirty-five of the wetlands are lacustrine fringe wetlands located at the heads and sides of coves and stream embayments, and on the main reservoir shoreline. These wetlands include areas both within and above the normal summer pool elevation, and include 22 PSS1C; five PFO/SS1C; three PFO1C; one PFO1A, one PSS/EM1C; one PEM/SS1C; and two PEM1C wetlands on the main reservoir and cove shorelines or at cove heads. Two PFO1A wetlands were identified in stream riparian zones just upstream



of the mouth of the stream, but at a slightly higher elevation than normal summer pool. The dominant vegetation species in scrub-shrub and emergent wetlands include black willow, sycamore, buttonbush, alder, water willow (*Justicia americana*), soft rush, and woolgrass. Common species in the forested wetlands include green ash (*Fraxinus pennsylvanica*), hackberry (*Celtis occidentalis*), sweetgum (*Liquidambar styraciflua*), red maple (*Acer rubrum*), and box elder.

Six of the wetlands identified during the current survey are small patches of water willow (37-1; 37-3; 37-4; 37-5; 41-2; 41-6; 42-2) that are completely within the summer pool of the reservoir. These non-persistent emergent wetlands are very small, ranging from approximately 0.01 to 0.07 acres, and occur near the shoreline of coves. At winter pool, there may be little or no evidence of these wetlands.

Wetlands in parcels 8, 24, 26, 28-1, 31, 37, 40, 41, 51, 53, 63, 67, 70, 72, and 80 were considered functionally significant (Table H-3). These wetlands were considered to perform, or potentially perform, a number of functions that are important for the maintenance or improvement of water quality, the stabilization of the reservoir shoreline, and the preservation of wildlife habitat. These wetlands include the linear wetlands along the shoreline and in coves and wetlands in or adjacent to disturbed areas. These functionally significant wetlands are referred to as "Category 1" wetlands in subsequent discussions.

Even though many of the wetlands were not considered to be "functionally significant" due to their small size, impacts to these wetlands could result in cumulative wetland impacts in the watershed or localized effects to other resources (i.e., loss of habitat) and, thus, should be avoided or minimized. Such wetland areas were characterized as "Category 2" wetlands for analysis purposes.

All of the wetlands, whether determined for management purposes to be functionally significant or not, would be protected from most direct impacts through compliance with federal mandates and legal requirements for wetlands protection.

A brief description of the functionally significant wetlands and their functions follows. The first number is the parcel number and the second number is the wetland number (i.e., 41-5 is wetland 5 on parcel 41). Parcel 63 contains a large wetland complex and is discussed separately following the other Category 1 wetland descriptions.

**Wetlands 8-2 and 8-3:** Wetland 8-2 is a PFO1C wetland at the mouth of Lost Creek where the stream enters the embayment. This part of the wetland merges into a small PFO1A wetland (8-3) in the riparian zone of Lost Creek. Adjacent to the wetland is a dirt access road that slopes down to the stream area from a nearby paved road. Functions include wildlife habitat, sediment retention, plant species and community diversity, and contaminant removal. The estimated size of the wetland area is approximately 1 acre.

**Wetland 24-1:** This long, fringe, PFO/SS1C wetland is located on the sides and at the head of the Tankersley Branch cove. The estimated size of the wetland is 1.2 acres. Functions include shoreline stabilization, wildlife habitat, sediment retention, plant species and community diversity, and contaminant removal.

**Wetland 26-1:** This long PSS1C wetland is located both at the head and along the shoreline of the cove. The estimated size of the wetland is 1.6 acres. Functions include shoreline stabilization, wildlife habitat, plant species and community diversity, and sediment retention.

**Wetland 28-1-1:** A long, narrow, fringe of PSS1C wetland is on the shoreline of Gourdneck Hollow cove. There is a pasture on the landward side. The wetland abuts an old road or boat launch. The estimated size of this wetland is 0.4 acres. Functions include shoreline stabilization, sediment retention, contaminant removal, plant species and community diversity, and wildlife habitat.

**Wetland 31-1:** This is a PSS1C wetland that encircles the head of a cove. There is steep-sided cattle pasture on one side of the wetland, but it appeared that the cattle were fenced out of the cove. The

estimated size of this wetland is 0.2 acres. Functions include shoreline stabilization, wildlife habitat, sediment retention, and contaminant removal.

**Wetland 37-2:** This is a highly disturbed emergent wetland at the head of a cove. The wetland is located in and on the edge of the water. The land is used as pasture down to the edge of the water and cattle have unrestricted access to the water. Grazing and trampling appear to have had a large impact on the vegetation, resulting in fewer plant species and fewer individual plants. The estimated size of the wetland is 0.2 acres. The functions of an undisturbed wetland in the same location would likely include shoreline stabilization, sediment retention, contaminant removal, plant species and community diversity, and wildlife habitat. These functions are currently diminished because of cattle access to the water and wetland. This wetland was, however, placed in Category 1 because it is very likely that its vegetative structure and functions could be restored and improved if the disturbance (the cattle) were fenced out of the water and shoreline area.

**Wetland 40-1:** This fringe, PFO/SS1C wetland is located around the edges of an embayment at and between where two streams enter. It is in a small area of the Winchester Springs Branch embayment on the upstream side of Route 130. The estimated size of the wetland area is 1.0 acre. Functions include wildlife habitat, sediment retention, plant species and community diversity, and contaminant removal.

**Wetland 41-1:** This is a PEM/SS1C wetland on an alluvial bench on the side of a cove and around the head of the cove. The estimated size of this wetland is 1.1 acres. Functions include wildlife habitat, sediment retention, plant species and community diversity, and contaminant removal.

**Wetland 41-5:** This is a wide PSS1C wetland at the head of a cove. It may grade into a forested wetland above the cove head. Dominant species include black willow, sweetgum, sycamore, river birch, silky dogwood (*Cornus amomum*), soft rush, and sedges (*Carex* sp., *Scirpus* sp.). The estimated size is 1.2 acres. Important functions are wildlife habitat, shoreline stabilization, sediment retention, and plant species and community diversity.

**Wetlands 51-1 and 51-2:** Wetland 51-1 is a narrow, FO wetland that merges into a long, narrow, PSS1C fringe wetland (51-2) along the main reservoir shoreline. The estimated size of the wetland is 5.5 acres. Functions include shoreline stabilization, wildlife habitat, sediment retention, plant species and community diversity, and contaminant removal.

**Wetlands 53-1 and 53-2:** Wetland 53-1 is a PFO1A wetland in a level area that is frequently saturated and may be occasionally flooded. It merges into wetland 53-2 which is a PSS1C fringe wetland on the main reservoir shoreline. This wetland area is located at the tip of a peninsula at Acklen Bend. The estimated size of the wetland is 16.2 acres. Functions include shoreline stabilization, wildlife habitat, sediment retention, plant species and community diversity, and contaminant removal.

**Parcel 63 wetlands:** Parcel 63 contains FO, SS, and EM interspersed with open water areas. Almost the entire area within parcel 63 is a large wetland complex that encompasses temporarily and seasonally flooded areas in the Elk River floodplain north of Beth Page Road and seasonally and semi-permanently flooded areas in the reservoir south of Beth Page Road to River Mile 165. This wetland complex is considered to be an uncommon habitat and community type which is important to the reservoir's biological and landscape diversity. Representative areas within parcel 63 were field surveyed to verify the National Wetlands Inventory (NWI) mapping. The NWI mapping appeared to be generally accurate with respect to wetland boundaries and areas. There were some differences found in the wetland classifications assigned by the NWI. This is a result of wetland vegetation communities changing over time (for example, from a sedge-dominated emergent wetland to a black willow-buttonbush dominated scrub-shrub wetland), and not changing the wetland determination. There are also beaver populations in at least one area that may or may not have been there at the time the NWI-utilized aerial photographs were taken.

In five areas in parcel 63, the field survey findings differed from the NWI mapping. These areas include the wetlands designated as 63-1, 63-2, and 63-3, which are seasonally or temporarily flooded areas in the

floodplain of the Elk River north of Beth Page Road, and wetlands 63-4 and 63-5, which are temporarily or seasonally flooded areas in the floodplain south of Bethpage Road.

**Wetland 63-1:** This is a temporarily flooded, partly wooded and partly cleared area that is used for cattle pasture. This area is not a jurisdictional wetland, although there may be small areas associated with a seep in the floodplain that would meet jurisdictional criteria. The NWI indicates only a linear, PFO1A wetland along a stream that flows through this area.

**Wetland 63-2:** This wetland occurs in an area of "pits" and mounds formed by past sand quarry activities. Most of the area in the "pits" is temporarily or seasonally flooded and meets the criteria for a jurisdictional wetland. The mounds are upland. Because of the complexity of the topography, it would be inadvisable to attempt to delineate a wetland boundary based on the USACE criteria. Thus, the entire "pit"-and-mound area was included in the wetland boundary. The NWI indicates PFO1A and PEM1A wetlands in this area, but they are smaller and of a different shape than the wetland areas identified in the field.

**Wetland 63-3:** This is a relatively undisturbed forested floodplain that lies between a PFO1C wetland to the north and Beth Page Road to the south. The NWI does not indicate wetlands in this area. The area is subject to temporary flooding, but does not have hydric soils; thus, it does not meet the criteria for a jurisdictional wetland. This floodplain forest, however, does perform some of the same important functions, including floodflow alteration and provision of wildlife habitat.

**Wetlands 63-4 and 63-5:** These are actually a single wetland area, part of which appears to be seasonally flooded (63-4; PFO1C), and part temporarily flooded (63-5; PFO1A). The wetland is located in the floodplain and is partially or wholly inundated during high flow events and when reservoir water levels are high. It adjoins an open pasture and emergent wetland and is used by cattle. The NWI indicates a PFO/SS1A along the river shoreline adjacent to and in the area identified during the current survey. This area is an example of not only the change in vegetation communities over time (from SS/FO to FO), but also a change in hydrology that appears to have resulted in an expansion of the wetland. Similar alterations in vegetation and hydrologic regime may have also occurred in other parts of the parcel 63 wetland complex.

Because of its large size and diversity of habitats, this wetland complex is functionally highly significant. The wetlands include lacustrine fringe in the Tims Ford Reservoir section and riverine wetlands along the main channel of the Elk River upstream of the reservoir. Functions include shoreline stabilization, sediment retention, carbon production and export, nutrient cycling, contaminant removal, and functions associated with floodflow alteration. An important function is the provision of a large tract of wildlife habitat which includes an interspersed of forested, shrub, herbaceous, and open- water areas.

**Wetland 67-1:** This is a long, wide shoreline fringe PSS1C wetland on the main reservoir shoreline. There is open, agricultural land on the landward side. The estimated size of the wetland is 15.8 acres. Functions include shoreline stabilization, wildlife habitat, plant species and community diversity, sediment retention, and contaminant removal.

**Wetlands 70-1 and 70-2:** Wetland 70-1 is a wide PSS1C fringe wetland that extends for a long distance along the main reservoir shoreline. Wetland 70-2 is on the shoreline at the mouth of a stream near to wetland 70-1 and, thus, is considered a part of 70-1 for functional and protection purposes. The estimated size of the two wetlands combined is 6.8 acres. Functions include shoreline stabilization, plant species and community diversity, wildlife habitat, sediment retention, and contaminant removal. This wetland is a buffer between the reservoir and open, agricultural land on the landward side.

**Wetland 72-1:** This approximately 0.5-acre wetland is located on the main reservoir shoreline. The point of land on which this wetland is located is primarily pasture down to the shoreline. Thus, this wetland may represent perhaps the only section of the shoreline on this parcel that is stabilized with vegetation. Functions include shoreline stabilization, sediment retention, nutrient removal, plant species and community diversity, and wildlife habitat.

**Wetland 80-1:** This is a large, wide, fringe PSS1C wetland on the main reservoir shoreline. The estimated size is 7.0 acres. The functions include shoreline stabilization, wildlife habitat, plant species and community diversity, and possible sediment retention and contaminant removal from adjacent cleared and developed land.

### **3.7.2 ENVIRONMENTAL CONSEQUENCES**

In all, twenty parcels contain wetlands within at least a portion of the parcel boundaries. Fifteen of these parcels (8, 24, 26, 28-1, 31, 37, 40, 41, 51, 53, 63, 67, 70, 72, and 80) contain functionally significant (i.e., Category 1) wetlands. Category 2 wetlands are located within the remaining 5 parcels (15, 33, 78, 79, and 79A). All of the wetlands, whether they were determined to be functionally significant or not, would be protected from most direct impacts through compliance with federal mandates and legal requirements for wetlands protection. Regulatory protection is extended to wetlands under Section 404 of the Clean Water Act and also under the State of Tennessee's Water Pollution Control program. TVA is subject to Executive Order 11990, Protection of Wetlands, which mandates that federal agencies take such actions as may be necessary to "minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands...on federal property." Consistent with this requirement, TVA and TDEC would, to the extent practicable, take measures to either avoid adverse impacts to wetlands or mitigate unavoidable effects to wetlands in disposing of land or during TVA's Section 26a review of water-use facilities. Also, wetland protection requirements of Section 404 permitting ensure no net loss of wetland functions and values.

#### **Alternative A**

Under Alternative A, only those wetlands identified as Category 1 (i.e., having functional significance) would be allocated for sensitive resource protection, while several important Category 2 wetlands would not. Under this alternative, five parcels containing Category 2 wetlands would be allocated for Natural Resource Conservation (Zone 4), while two parcels containing wetlands would be allocated for Industrial/Commercial Development (Zone 5) and Developed Recreation (Zone 6). Potential effects on these wetland areas would depend on the type and extent of development and the specific protection measures that would be developed on a site-specific basis. Protection of these areas would be afforded by including parcel-specific descriptions of wetland resources and the imposition of requirements for wetland protection measures on any future site planning or development. Examples might include upland buffer zones between the wetland and upland development, use of best management practices, and the creation of conservation easements.

Under Alternative A, some areas of significant wetlands would be protected by virtue of the allocation of their respective parcels. Although entire tracts containing wetlands of lesser functional significance would not be protected, the wetland areas present on these parcels would be protected under Section 404 of the Clean Water Act and also under the State of Tennessee's Water Pollution Control program. If these areas were impacted by some developmental activity, mitigation requirements would offset any long-term loss of wetland functions. However, even with mitigation there would be some short-term loss of wetland functions in the time it would take for the mitigated wetlands to develop a mature stand of wetland vegetation.

#### **Alternative B**

Under this alternative, twelve parcels containing Category 1 wetlands and two parcels with Category 2 wetlands would be placed in zone 3 or 4, which would provide protection to these wetlands from potential impacts from development. Five other parcels, three of which contain Category 1 wetlands, would be allocated for development (i.e., placed into Zones 5, 6, or 7).

As described above, wetlands present on these parcels would be protected under both state and federal laws. Any potential activities in wetlands would be regulated under these state and federal programs. Development in wetland areas would be avoided whenever a practicable alternative exists.

#### **Alternative B1**

This alternative differs from Alternative B in only minor aspects, with the main difference being in the allocation of two Category 1 wetland areas into Zone 8 (Conservation Partnership). Similar to Alternative B, fourteen parcels containing Category 1 and Category 2 wetlands would be placed in zones 3 and 4. The difference is that there are eleven parcels containing Category 1 wetlands and three parcels containing Category 2 wetlands in these two zones (compared to twelve and two under Alternative B). The number of parcels containing Category 1 wetlands that would be allocated for recreational (parcel 80) and residential development (parcels 31 and 51) would be reduced from five to three parcels. No parcels containing Category 1 wetlands and one parcel (78) containing a Category 2 wetland would be designated for Industrial/Commercial development.

Unlike Alternative B, all or a portion of two of the parcels (28-1; 8-2) containing Category 1 wetlands (28-1; 8-2) would be zoned for Conservation Partnership. Parcel 28-1 is adjacent to parcels in zone 4. The majority of parcel 8, outside of the Zone 8 area, is in Zone 4. The Conservation Partnership Zone should provide these wetlands with a higher degree of protection than in other developmental zones because of the establishment of shoreline buffer zones in exchange for shoreline access.

As with the other alternatives, the potential effects to the wetland areas in those parcels zoned for some type of development, and the specific protection and mitigative measures required, would depend on the type and extent of development. Wetlands present on these parcels would be protected under both state and federal laws, and any activities in wetlands would be regulated under these state and federal programs. Development in wetland areas would be avoided whenever a practicable alternative exists.

Increased boating activities, pollution, and human activity could result in a decline in wetland quality and size when Zone 8 areas directly adjoin a wetland or when there is a proliferation of these activities resulting from multiple water-use facilities surrounding a wetland. Areas of specific concern are those in the vicinity of parcels 71-1, 71-2, 71-3, 71-4, 52-3, and 52-4 where the proximity of the water-use facilities, in a relatively narrow channel, could cause a decline in quality of the large wetland located on the narrow peninsula across the reservoir from the Murray Lake Estates.

For each Section 26a application for a community facility within Zone 8, a site-specific environmental review at the appropriate level would be conducted to include a review of impacts on wetlands. Impacts to wetlands would be avoided or minimized through appropriate mitigation measures included in Section 26a permits and required by the Corps of Engineers Clean Water Act, Section 404 permits.

### **Alternative C**

Under this alternative, 10 wetlands would be allocated to zones for development(i.e., Zones 5, 6, or 7). Nine of these parcels contain Category 1 wetlands within their boundaries.

Adoption of this alternative would result in the greatest potential for adversely impacting wetlands of the project area. Avoidance of wetland areas and appropriate mitigation for wetland impacts could reduce overall direct effects to wetlands. However, extensive development would increase the potential for indirect (perhaps inadvertent) wetland impacts. Such impacts could result from a variety of conditions, such as changes in surface drainage patterns, contaminated or highly fertilized runoff from lawns, siltation or sedimentation from uphill or upstream clearing, or other changes in hydrological conditions along the shoreline.

### **Alternative D**

Alternative D, the Maximum Land Conservation alternative, provides a marked increase in the number of parcels dedicated to Natural Resource Conservation (Zone 4) or Sensitive Resource Management (Zone 3). All but two of the twenty parcels containing wetlands and all of the parcels containing Category 1 wetlands would be assigned to Zones 3 or 4. Two parcels containing Category 2 wetlands would be allocated to Zones 5 and 6. This increase would benefit the wetlands while allowing for compatible land uses if the proper BMPs were implemented.

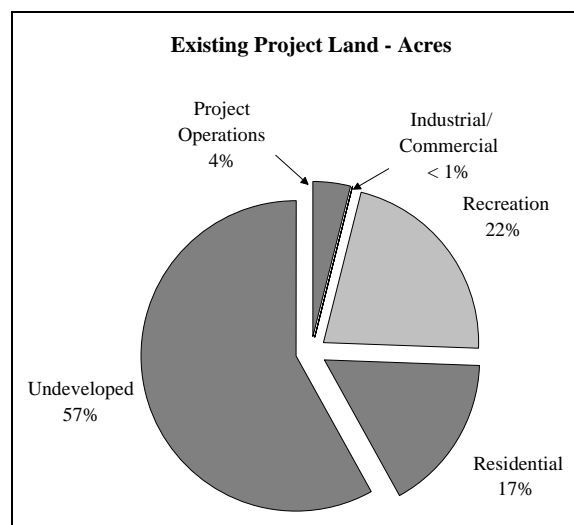
This alternative would provide increased management and protection for Category 1 and 2 wetlands throughout the project area. This alternative would add two additional parcels to a Zone 4 status above all other alternatives.

### 3.8 PROJECTED LAND-USE CHANGES

#### 3.8.1 AFFECTED ENVIRONMENT

The Elk River drains an area of 2,247 square miles in south central Tennessee and north central Alabama. This watershed is a predominantly rural area comprised mostly of fragmented forests and agricultural uses. Tims Ford Reservoir is a predominant feature within the watershed and influences surrounding land-use patterns. Approximately 55 percent of all the land in the watershed is currently in agricultural use with pasture and grassland being the largest component. The current trend of steady growth and development for this region may be accelerated as the "baby boom" generation approaches retirement. The demand for waterfront property may exceed the growth anticipated for the region. The increasing demand for waterfront property often results in conflicting land-use patterns.

Tims Ford Project lands are located in Franklin and Moore Counties, Tennessee. The current project land use consists of agricultural, residential, recreational, and some light commercial/ industrial activities. Public recreational areas consist of day- use areas, parks (city and state), and informal access areas. There are also two commercial marinas. Light industrial or commercial uses include the TDEC office building complex and water intakes.



**Figure 3.8-1 Existing Project Land Uses**

A total of 4,779 acres of project land are undeveloped. This public land provides opportunities for informal recreational use such as bank fishing, hunting, hiking, plant and wildlife observation, and provides important wildlife habitat. It is currently managed by both TVA and TDEC. There are 71 current agricultural areas licensed comprising 1,145 acres of project land, shown in Appendix H, Table H-6. These licenses are for both row crops and pasture. The current practice allows cattle to freely access the water. The existing agricultural licenses have been approved for extending another two calendar years. During this period each license will be evaluated to determine compatibility with the allocated use of the land. Agricultural licensing of public land is an acceptable interim use that can provide diversity to the landscape and also provide wildlife habitat. Proper Best Management Practices will be incorporated into future licenses to provide wildlife habitat and protect soil resources and water quality.

Due to potential impacts on water quality and public recreation, livestock grazing on TVA land will be phased out over time in order to allow those with livestock to obtain other pasture.

Existing residential development and use includes 1,493 acres sold in 21 TERDA-developed subdivisions along 35 miles of shoreline. The 30 private subdivisions and private license include approximately 1,064 acres on backlying property that adjoins project land along 17 miles of shoreline. The adjoining 122 acres of project land along 17 miles of shoreline is allocated to Zone 7 (Residential Development/Access), including the TERDA-sold subdivisions, subdivisions developed on adjoining private land, and project lands fronting the private subdivisions totals 2,679 acres and 52 shoreline miles.

Access rights to the water were included in the deed to most of those TERDA lands sold up to the 895-foot contour and developed for private residential access to the reservoir. These lots with the specified deeded access rights are considered waterfront properties, and the landowners are eligible to request permission from TVA to construct private water-use facilities through the Section 26a process. Other

subdivisions were developed by private individuals on backlying property adjoining Tims Ford Project land. Landowners in these privately-developed subdivisions do not possess the necessary land rights for private water-use facilities or other uses of the water. TVA does not consider such lots as waterfront lots. TVA guidelines require property owners to possess specific deeded rights across public lands in order to have a permitted water-use facility. The access rights for these non-waterfront lots have historically been provided by a land-use license for a fee. All the subdivisions including TERDA- sold land and the privately developed land are listed in Appendix H, Table H-7.

There are eight public recreational use areas which contain a total of 12.1 shoreline miles, ( i.e., 4.4 percent of the total shoreline miles). Additionally, the cities of Winchester and Estill Springs maintain city parks containing approximately 1.1 shoreline miles (less than one percent of the total shoreline miles). Tims Ford State Park occupies 39.3 shoreline miles, which comprises 14.3 percent of the total shoreline. Public-use areas and site-specific information are listed in Table 3.8-1.

**Table 3.8-1 Public-Use Areas**

<b>Public-Use Area</b>	<b>County</b>	<b>Location</b>	<b>Facilities</b>
Lost Creek	Moore	Lost Creek Mile 3.8 Left Bank at Sanders Causeway	Paved parking, a launching ramp, and a courtesy dock
Turkey Creek	Franklin	Hurricane Creek Mile 4.9 Left Bank	Paved parking, a launching ramp, and a courtesy dock
Anderton Branch	Franklin	Anderton Branch off Lost Creek Mile 0.7 Right Bank	Paved parking, a launching ramp, and a dock
Devils Step Campground	Franklin	Elk River Mile 154.4	Paved parking, full setups for campers, a launching ramp, and a courtesy dock
Rock Creek	Franklin	Rock Creek and Elk River Mile 161.9 Right Bank	Paved parking, restrooms, a launching ramp, a courtesy dock, and picnic facilities
Dry Creek	Franklin	Elk River Mile 153.2 Left Bank	Sandy beach, restrooms, and launching ramp with unimproved road access
Pleasant Grove	Franklin	head of Little Hurricane Creek	Paved parking, bathrooms, launching ramp, courtesy dock, and picnic facilities
Tims Ford Dam Reservation	Franklin	Tims Ford Dam on the Left Bank.	Large paved parking areas, boat ramp, courtesy dock, canoe launch, and tailwater fishing area.

#### Other Water Access Points

Tims Ford State Park Marina, located in Tims Ford Rustic State Park on Travis Hollow, is managed by contract and includes a launching ramp, store with kitchen, gas sales, picnic tables, and restrooms.

Winchester City Park, located north of Red Mill Bridge on Boiling Fork Creek in Winchester, has paved walking trails, a formal playground, a meeting hall, a public pavilion with kitchen and tables, playing fields, two courtesy water-use facilities, recreation vehicle (RV) camping, and two launching ramps.

Tims Ford Marina is located in Anderson Branch at the Mansford Bridge on Mansford Bridge Road adjacent to Tims Ford State Park. This private marina operates a restaurant and store, boat sales and repair, rental cabins, gas sales, a launching ramp, and 152 rental boat slips.

Holiday Marina is located in the Center Grove Community near the head of Lick Creek on the left bank at the end of Awalt Center Grove Road. This state-owned marina has a launching ramp, rental cabins, rental boat slips, and a store.

There are several unimproved reservoir access points. Most of these are by bridge crossings, in the back of coves, or where old road beds enter the reservoir.

Currently, the TVA high-voltage transmission lines that cross Project land are the Winchester-Fayetteville-Ardmore (L 5723), the Winchester-Tims Ford (L 2631), the Winchester-Estill Springs (L 2631), the Winchester-Lynchburg (L 2435), and the Winchester-Cowan #1 (L 2514) lines. There are currently no known plans for future utility corridors crossing Project land.

### **3.8.2 ENVIRONMENTAL CONSEQUENCES**

Changes in land use would occur under each alternative. Under all the alternatives, 881 acres (31 shoreline miles) of Project land would be allocated to Zone 3 (Sensitive Resource Protection) to provide protection for state- or federally-protected species and significant wetlands. Previously, individual environmental reviews were conducted on a case-by-case basis for each proposed development to determine if sensitive resources would be impacted.

Currently, there are 4,779 acres that are considered undeveloped and 2,821 acres that could be considered for development. Proposed new development under Alternatives A, B, B1, and C would result in changes to the current land use. Most of the land meeting development criteria are gently sloped with tillable soils and are presently in a combination of pasture or open lands and reverting fields with scattered fence rows and woodlots. The acreage of land-use change resulting under each alternative is listed in Table 3.8-2. Parcels that would result in land-use changes under Alternatives A, B, B1, and C are listed in Appendix H, Table H-8. No new development is proposed under Alternative D; therefore, the only change in land use would be to provide for sensitive resource protection.

**Table 3.8-2 Changes in Land Use by Allocation Zone (Acres)**

<b>Zone</b>	<b>Alternative A</b>	<b>Alternative B</b>	<b>Alternative B1</b>	<b>Alternative C</b>	<b>Alternative D</b>
5 - Industrial/Commercial	up to 61	61	61	61	0
6 - Recreation	up to 297	297	297	297	0
7 - Residential	up to 2,463	816	698	2,463	0
8 - Conservation Partnership	0	0	33	0	0
Total	up to 2,821	1,174	1,056	2,821	0

#### **Industrial/Commercial Development**

Potential industrial or commercial development for Tims Ford Reservoir could consist of educational facilities and a construction staging area for assembling water use facilities by commercial builders.

Under Alternative A, requests for a total of 61 acres could be considered for Zone 5 (Industrial/Commercial Development) on a case-by-case basis. Under Alternatives B, B1, and C, the 61 acres would be allocated for industrial or commercial development purposes. Under Alternative D, no additional land would be allocated for Industrial/Commercial Development.



**Recreation**

Under all alternatives, allocations would be made so that current recreational use would continue, (approximately 279 acres). Under Alternative A, decisions would be made on a case-by-case basis for approximately 297 acres for recreational use.

If Alternative B, B1, or C were adopted, approximately 576 acres would be directly available for recreational use. Parcels 19, 32, and 76 would be designated as future recreational lands. Allocation of Parcel 19 to Zone 6 (Recreation) would allow for possible future expansion of the existing privately-owned marina. Parcel 76 could be used to expand the existing campground and day-use areas. Parcel 32 is conducive for future water-based recreational purposes. Allocating Parcel 80 for recreation would allow for the expansion of the existing Winchester City Park. No new development is proposed under Alternative D.

**Residential Development**

Existing - privately-developed subdivisions which were historically allowed permits and licenses for private water use facilities will be allowed to continue this practice in the future. Project lands fronting these subdivisions are allocated to Zone 7 (Residential Development/Access). Any new subdivision that is not fronting land currently allocated to Zone 7 will not be considered for water-use facilities. Those existing permitted private water use facilities in areas outside of platted subdivisions will be allowed to remain, but these rights may not be transferable or expanded and no new facilities will be permitted.

Proposed - Under Alternative A, there could be an additional 2,821 acres along 47.8 shoreline miles considered for residential development on a case-by-case basis. Using the ratio of 1 acre per lot there could be as many if not more than 2,821 new homesites around the reservoir. Assuming that each shoreline mile could support 25 lots, this alternative has the potential for an additional 1,195 lots adjacent to the reservoir. Added to the existing 1,409 waterfront lots already available, implementation of Alternative A could almost double the number of lots adjacent to the reservoir. Total build-out would represent an 85 percent increase in the number of waterfront lots.

Under Alternative B, 816 acres along 13.1 shoreline miles would be allocated for new residential development. The proposed action states that the new developments will not have waterfront lots, but rather access to the reservoir through designated community facilities. The community facilities would follow the current TVA SMP guidelines. Depending on physical conditions, some subdivisions could have several facilities with a launching ramp, parking, recreational facilities, and a multislip community water-use facility. Using the ratio above, the new developments could have at least 816 new homesites. This is a substantial increase in the number of residential lots.

Alternative B1 reallocates 51 parcels consisting of 33 acres along nine miles of shoreline to the new category - Zone 8 (Conservation Partnership). It is difficult to determine the amount of residential development and associated impacts that could occur as a result of Zone 8. Based on available information, the average acreage of backlying subdivisions is 34 acres. Additionally, the average acreage of all existing subdivisions per shoreline mile is 50 acres. The largest subdivision covers 82.2 acres, while the smallest covers 4.2 acres. As currently proposed, 51 parcels have been allocated to Zone 8 which could support 58 community facilities under the proposed guidelines. Assuming a 34-acre subdivision per Zone 8 parcel, new developments adjoining the Zone 8 parcels could total 1,734 acres or more new homesites adjacent to the reservoir. This is more than triple the number of homesites as compared to Alternative B. A more conservative estimate, assumes a 50-acre per shoreline mile, and could total approximately 450 acres or one and one half times more new homesites adjacent to the reservoir than Alternative B. However, some development has already occurred in the areas behind Zone 8. Further, although the creation of Zone 8 could facilitate some of this development, much of it could occur whether or not this land was allocated to Zone 8.

Under Alternative C, 2,821 acres along 47.8 shoreline miles would be allocated for new residential development. Using the ratio of 1 acre per lot there could be as many if not more than 2,821 new homesites around the reservoir. Assuming that each shoreline mile could support 25 waterfront lots, this alternative has the potential for an additional 1,195 waterfront lots. Added to the existing 1,409 waterfront

lots already available, implementation of Alternative C could almost double the number of waterfront lots. Total build-out would represent an 85 percent increase in the number of waterfront lots.. No additional land would be allocated for Residential Development under Alternative D, therefore, there would be no increase in homesites on project land or waterfront lots if this alternative were implemented. Development of private land adjacent to the project would likely continue to occur, but without access to the reservoir the rate of development would be expected to be much slower.

### **Conclusion**

Creation of the Tims Ford Project has been the single most significant change in the land use and landscape of Franklin and Moore County. Except for the dense urban development in the incorporated cities and towns, the highest density of rural residential development occurs around the shores of Tims Ford Reservoir. The original congressional intent of the Tims Ford Project, to foster the economic and social development of the Elk River Watershed, and the creation of TERDA has driven this development both on the project lands and on those adjoining private lands. For all alternatives, beneficial effects for preserving current land uses would be realized from the allocation of 881 acres to Zone 3 (Sensitive Resource Protection) and to varying degrees, Zone 4 (Natural Resource Conservation). Potential impacts to land use would result from allocating currently undeveloped land to Zones 5, 6, 7, and 8, which would result in developments such as industrial/commercial, recreational, and residential uses. This could occur under Alternatives A, B, B1, and C. Implementation of Alternative D would result in little or no adverse changes in land use because no new development is proposed.

The potential for the most significant change in land use would occur under Alternatives A and C with 3,228 acres of project land allocated or suitable for development. This is half of the plannable lands considered under this study. Either of these alternatives have the potential to significantly alter the current land use on and surrounding the project. Residential development alone could potentially include an additional 2,585 homesites. Along with this development would be an exponential increase in development of the surrounding private property. With the influx of additional visitors and homeowners, Alternatives A and C have the greatest potential for significantly affecting land use in the local surrounding area, but would not likely show any significant effect on land use at the regional level. Alternative B limits the amount of new development to project lands and does not provide for additional access to serve new private subdivisions.

Implementation of Alternative B would result in land-use changes for 1,581 acres to accommodate potential new development. Of this total for development, 938 acres is allocated for residential use. Under Alternative B, a majority of the plannable lands (4,486 acres) would be set aside for Natural Resource Conservation and Sensitive Resource Management, which lessens the impacts of the land-use changes. This alternative offers a compromise in the level of development between Alternative D and the higher levels considered under Alternatives A and C. Although this approach balances land-use allocation and lessens the amount of potential development, it will result in land-use changes to considerable amounts of public land.

Alternative B1 reduces the acreage allocated in Alternative B to Zone 7 (Residential Development/Access) and Zone 6 (Recreation) by eight percent, while adding 33 acres to Zone 8 (Conservation Partnership). Land-use impacts would be very similar to Alternative B except for the additional Zone 8 allocation. While the allocation of the 33 acres to Zone 8 is a small portion of the total 6,453 plannable acres, it has the potential to impact land use by encouraging development of the adjoining private property. Despite this potential indirect impact on land use, the conservation partnership easements may offer some protection and benefits to other resources.

Implementation of Alternative D would result in little or no adverse changes in land use because no new development is proposed. Rate of development growth around the reservoir would slow due to the lack of additional available reservoir properties.

Changes in land use, especially to residential use in Alternatives A, B, B1, and C, would also affect the land lying below the 895-foot contour and the associated resources along the shoreline. Typically lot owners in the private subdivisions and waterfront property owners have significantly altered the natural

state of the land by removing the native vegetation, creating lawns, and constructing improvements. The acreage figures do not reflect the number of acres impacted below the 895-foot contour.

Mitigative and protective measures would be needed to lessen the impacts associated with Alternatives A, B, B1, and C. These measures should include careful planning of subdivisions and vegetation restoration. Site-specific construction BMPs and environmentally sensitive planning of new developments such as size of residential lots, "green subdivisions", set back lines, and road construction would lessen potential adverse impacts of land use. For the Zone 8 conservation partnership easements to be effective in protecting the current project land use, additional mitigative measures may be needed. These measures would be identified during the 26a site specific review and could include increasing the buffer easement, not allowing vegetation removal except within a 20-foot wide corridor to serve the community facility, allowing launching ramps only where existing slopes are conducive, and prohibiting grading or filling. The permits and licenses for the community facilities in Zone 8 would include a revocation clause for failure to abide by all the conditions in these instruments. Given past experience with some adjoining landowners encroaching on public land, increasing education and enforcement efforts to protect the conservation partnership buffers and public land would be needed. Without increased emphasis on enforcement to protect the safeguards listed above, the value of the conservation partnership easements could be diminished.

Allocations under any alternative would supersede previous TERDA plans. Both Franklin and Moore Counties have zoning which allocates land into agricultural and residential zones. Most of the lands being planned on Tims Ford Reservoir are considered "unzoned" on the maps. Parcel 36, which the agencies propose to allocate to Zone 7, is allocated to residential development on the Franklin County zoning map. Therefore, the proposed allocations in the Tims Ford Reservoir Land Management and Disposition Plan are consistent with local plans. Although urban growth boundaries are not yet approved for Franklin County, the agencies anticipate that those parcels allocated to Zone 4 would serve as open space within the future urban areas.

### **3.9 CULTURAL RESOURCES**

#### **3.9.1 AFFECTED ENVIRONMENT**

For at least 12,000 years, the Elk River Valley has been an area for human occupation which became more intense through succeeding cultural stages. Archaeological investigations have demonstrated that Tennessee and the Elk River Valley were the setting for each one of these cultural stages, from the Paleo-Indian (11,000-8000 BC), the Archaic (8000-1200 BC), the Woodland (1200 BC-AD 1000), the Mississippian (AD 1000-1500), to the Protohistoric-Contact Period (AD 1500-1750). In addition, historic era cultural traditions have included the Cherokee (AD 1700-present), European- and African-American (AD 1750-present) occupations. Moreover, investigations have provided additional details about the changing environments, shifting subsistence strategies and settlement patterns, and variations in the cultural material associated with prehistoric and historic occupations (Faulkner, 1968; Coverdale, 1972; Hasty, 1973; Hubbert, 1982; Duvall, 1996, 1998; 1999; Lawrence, 1999). The completion of Tims Ford Reservoir inundated most of the archaeological resources located on the alluvial terraces and floodplains. The remaining sites are located on the uplands adjacent to the river and its tributaries.

TVA is mandated under the National Historic Preservation Act of 1966 (NHPA) and the Archaeological Resources Protection Act of 1979 (ARPA) to protect significant archaeological resources and historic properties located on TVA lands or affected by TVA undertakings. A historic property is "any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places." [16 U.S.C. 470w (5)]. Under ARPA, Federal Agencies are exempt from disclosure of locations of historic properties as required by the Freedom of Information Act.

In response to this federal legislation, TVA conducts inventories of its lands to identify historic properties. For the action proposed in this project, the Area of Potential Effect (APE) is the 6,453 acres of retained TVA and TDEC lands being planned or previously committed to specific land uses. The APE, as defined in 36 CFR §800.16(d), is "the geographic area or areas within which an undertaking may directly or

indirectly cause changes in the character or use of historic properties, if such properties exist.” The APE for cultural resources would comprise all TVA and TDEC land within the Lands Plan. The objective of the present archaeological survey was to locate and evaluate sites in the APE. Approximately 4,650 acres were surveyed for the lands plan and 69 miles of shoreline were surveyed for the Shoreline Management Plan.

Existing data along with the recent survey results were reviewed, and over 100 archaeological resources were identified within and along the Tims Ford Reservoir. A large number of these resources have been inundated due to reservoir impoundment. A total of 56 archaeological resources have been recorded in the area being planned. Fifty-two of these archaeological resources were recommended to be ineligible for listing in the National Register of Historic Places (NRHP), three were recommended to be potentially eligible for listing, and one site is recommended as eligible for listing. The archaeological resources that are recommended ineligible for listing in the NRHP do not contain deposits that would provide additional data to the archaeological record. For the resources that are potentially eligible for listing, further investigations of the archaeological resources are required to determine whether the resources are eligible for listing in the NRHP. A type site for one local phase of the Woodland Period, the Owl Hollow site, is located on lands covered in this EIS and is considered eligible for inclusion in the NRHP.

Pursuant of 36CFR Part 800, a Phase I archaeological survey has been conducted in the project area, and consultation was conducted with the Tennessee State Historic Preservation Officer (SHPO). Through consultation, it was determined that one archaeological resource was eligible and three archaeological resources were potentially eligible for listing in the NRHP within the lands surveyed for the EIS.

No historic structures have been identified within the Tims Ford Reservoir Land Plan.

### **3.9.2 ENVIRONMENTAL CONSEQUENCES**

Under any of the described alternatives in this EIS, TVA will conduct phased identification and evaluation procedure set forth in 36 CFR §800.4(b)(2), regulations of the Advisory Council on Historic Preservation implementing Section 106 of the National Historic Preservation Act, in order to identify, evaluate, and assess effects on historic properties and to determine the appropriate course of action prior to an undertaking. An Undertaking is defined under 36 CFR §800.16(y), “as a project, activity or program funded in whole or in part under the direct or indirect jurisdiction of a Federal agency, including those carried out by or on behalf of a Federal agency; those carried out with Federal financial assistance; those requiring a Federal permit, license or approval; and those subject to state or local regulation administered pursuant to delegation or approval by a Federal agency.” Approximately 72 percent of the lands involved in this plan have been surveyed for archaeological resources. Only one archaeological resource was determined eligible and three archaeological resources were determined potentially eligible for listing in the NRHP within the lands surveyed for the EIS. The results of archaeological testing on Tims Ford Reservoir would be consulted prior to undertaking site-specific activities. TVA would continue the present process of case-by-case review in TVA-controlled areas potentially subject to ground-disturbing actions such as dredging, shoreline development, or timber harvesting through Phased identification and evaluation of historic properties. Archaeological resources within these areas will be avoided whenever possible. If avoidance is not possible, then proper procedures will be implemented in the mitigation of the historic property. TVA will take necessary steps to insure compliance with regulatory requirements of NHPA and the ARPA. Under any alternative, the cumulative effects to significant archaeological resources would be minimized by avoidance, protection, and maintenance of the resource or by mitigation through data recovery excavations, pursuant to 36 CFR § 800.

Since no historic structures have been identified within the Plan, this undertaking will have no effect on historic structures.

Indirect and cumulative effects to archaeological resources include, but are not limited to, shoreline erosion due to cyclical inundation and ground disturbing activities. Continual shoreline erosion is practically unavoidable. Proper shoreline stabilization may minimize adverse effects on archaeological sites in some instances and needs to be addressed in a case-by-case manner.

Future disposal or ground disturbance proposed at any parcels not examined during this survey will require an archaeological survey prior to any land transfer or ground disturbance. Furthermore, parcels or portions of parcels 15, 41, 42, 53, and 63 will require additional Phase I testing prior to any ground disturbance or land disposition at areas with a potential for intact archaeological deposits.

**Alternative A**

The No Action Alternative provides for the continuation of TVA's current resource management at the Tims Ford Watershed. Dispersed recreational activities such as fishing, camping, and hiking would have little or no effect on the historic properties; however, development of a campground, parking lot, or a launching ramp could have a significant effect on these properties. There are archaeological resources that are considered eligible or potentially eligible for listing in the NRHP on Tims Ford Reservoir lands. Under this action, site-specific activities proposed in the future would be approved, mitigated, or denied according to the significance of the resource. All historic properties within these areas will be avoided, protected, and maintained. If avoidance is not possible, then any adverse effects to significant resources are mitigated. During mitigation appropriate archaeological investigation will be necessary, and potentially impacted resources will be properly recorded and removed. Alternative A does not provide for specific preservation of archaeological resources through an allocation process. However, TVA will comply with regulatory requirements of NHPA and the ARPA.

**Alternative B and B1**

Alternative B and B1 have the same consequences regarding cultural resources. These alternatives incorporate the Phased Identification and Evaluation procedure to effectively preserve historic properties. All sites recommended as eligible or potentially eligible for listing to the NRHP will require evaluation and/or mitigation if proposed development will have an adverse effect to the sites. Early identification of the presence of cultural resources through zoning avoids the likelihood of soil disturbing activities in areas known to contain historic properties. This would, in turn, save time, reduce costs, and ensure more efficient compliance with section 106 of the NHPA than under Alternative A. All soil disturbing activities that occur on parcels which contain historic properties will be reviewed by a TVA archaeologist. TVA will take necessary steps to ensure compliance with regulatory requirements of NHPA and the ARPA.

The investigations at Tims Ford Reservoir identified archaeological resources on three of the parcels. Three of the archaeological resources identified are in the Zone 3 (Sensitive Resource Management) and one is under Zone 4 (Natural Resource Conservation). Zone 3 and 4 would effectively preserve the resources. If disturbances to the resources could not be avoided, then further investigations would be required to determine the resources' eligibility for inclusion in the NRHP.

**Alternative C**

This alternative would incorporate the Phased Identification and Evaluation procedure to effectively preserve historic properties. All sites recommended as eligible or potentially eligible for listing to the NRHP will require evaluation and/or mitigation if proposed development will have an adverse effect on the sites. Early identification of the presence of cultural resources through zoning avoids the likelihood of soil disturbing activities in areas known to contain historic properties. This would, in turn, save time, reduce costs, and ensure more efficient compliance of section 106 of the NHPA than under Alternative A. All soil disturbing activities that occur on parcels which contain historic properties will be reviewed by a TVA archaeologist. TVA will take necessary steps to ensure compliance with regulatory requirements of NHPA and the ARPA.

Four archaeological sites are identified in the zones of Alternative C. Three of the archaeological resources identified are under Zone 3 (Sensitive Resource Management) and one is in Zone 7 (Residential Development/Access). Zone 3 would effectively preserve the resources. Further investigations will be required if the resources cannot be avoided. Zone 7 would have the most potential for development, and the identification of archaeological resources within this zone would enable development to avoid, protect, and maintain the resources effectively. However, if the resources could not be avoided, then further investigations would be required to determine the resources' eligibility for inclusion in the NRHP.

**Alternative D**

Under this alternative, no new development or ground disturbance is proposed; therefore, cultural resources on all parcels (surveyed or unsurveyed) would not be directly affected. The implementation of this alternative would not change TVA's responsibility as a Federal Agency to protect archaeological resources as required in ARPA and NHPA. A management and protection plan for these resources will be prepared by TVA pursuant to the requirements of NHPA and ARPA.

This alternative will incorporate the Phased identification and evaluation procedure to effectively preserve historic properties. All sites recommended as eligible or potentially eligible for listing to the NRHP will require evaluation and/or mitigation if proposed development will have an adverse effect to the sites. Early identification of the presence of cultural resources through zoning avoids the likelihood of soil disturbing activities in areas known to contain historic properties. This would, in turn, save time, reduce costs, and ensure more efficient compliance of Section 106 of the NHPA than under Alternative A. All soil disturbing activities that occur on parcels which contain historic properties will be reviewed by a TVA archaeologist.

The investigations at Tims Ford Reservoir identified archaeological resources on three of the parcels. Three of archaeological resources identified are under Zone 3 (Sensitive Resource Management) and one is in Zone 4 (Natural Resource Conservation). Zone 3 and 4 would effectively preserve the resources. If the resources could not be avoided, then further investigations would be required to determine the resources' eligibility for inclusion in the NRHP.

Alternative C has the highest potential to affect historic properties. The remaining Alternatives (A, B, B1, and D) have a lower potential to affect historic properties than Alternative C.

Since Contact No. 98RE2-229151 does not specify covenants for federal compliance pursuant to 36 CFR § 800, a Memorandum of Agreement (MOA) will be prepared and executed for identification, evaluation, and treatment of historic properties that are eligible for inclusion in the NRHP within the APE. National Register eligibility will be evaluated in consultation with the SHPO and other consulting parties according to stipulations of the MOA executed with the SHPO. Furthermore, mitigation of adverse effects to any historic property will be conducted according to the stipulations in the MOA.

**3.10 RECREATION****3.10.1 AFFECTED ENVIRONMENT**

The Tims Ford Reservoir region contains a number of public recreational areas, which draw hundreds of thousands of visitors annually. The demand for water-based recreation remains high and pressure to increase other types of recreation in and around the reservoir grows annually. However, the availability of overnight lodging is somewhat restricted. The Tims Ford State park offers seasonal cabin rentals, and the Tims Ford Marina has constructed approximately 15 new cabins. According to public comments received during the initial public scoping period, recreational opportunities in high demand include overnight lodging, hiking trails, protection of existing public lands (especially those with unique natural features), and wildlife observation areas.

Tims Ford Reservoir encompasses 10,680 acres covering 275 miles of shoreline. Current residential access to the Reservoir is approximately 52.4 miles (19 percent) of the total shoreline miles. Tims Ford State Park comprises 38.2 of the shoreline miles (13.9 percent). The nine Public Recreational Use Areas occupy 12.1 shoreline miles (4.4 percent), and the City of Winchester and Estill Springs City Park Site contain approximately 1.1 shoreline miles (less than 1 percent).

Although no accurate data have been established concerning the number of users of recreational facilities in the reservoir area, most officials believe that the usage is high and the demand continues to grow annually. Since 1996, Tims Ford State Park has seen significant increases in visitors. According to records, 890,054 people visited the State Park in 1998. This is an increase of 46 percent (or 413,000 people) compared to those who visited the park in 1996. Trends and analyses reveal that the region will

continue to experience moderate to high levels of residential and industrial growth. Because of this steady growth into the next millennium, anticipated demand for associated recreational opportunities from residents as well as tourists will likely remain high. Tims Ford Reservoir area is well suited to accommodate most, if not all, of these future recreational opportunities and needs.

Water-based recreation continues to be a driving force behind the anticipated and continued development of the property surrounding the reservoir. For nearly 30 years, water-based recreation on Tims Ford Reservoir has been extremely popular, and no decrease is anticipated. Activities such as water skiing, fishing, sailing, windsurfing, motorboating, swimming and the increasing popularity of personal watercraft bring thousands of visitors to the area. As the reservoir becomes more crowded, visitors will be turning to the Elk River and other streams to pursue recreational activities. Stream boating continues to gain in popularity nationwide, especially on rivers such as the Elk that are deemed unsuitable for power boating but have tremendous opportunity for canoeing and, possibly, kayaking. The portion of the Elk River below Tims Ford Dam is currently a haven for trout fishermen in middle Tennessee. The river is stocked primarily with rainbow and brown trout from March until September of each year.

Currently, 52.4 miles of Tims Ford shoreline has residential development. Three marinas are located on Tims Ford Reservoir. Tims Ford Marina has recently expanded to 282 slips with 20 spaces for parking vehicles with trailers. Holiday Marina has 77 slips and approximately 52 spaces for parking vehicles with trailers. Tims Ford State Park Marina does not have marina slips, but has 50 designated parking spaces for vehicles with trailers. There are eight public-use areas with boat launching ramps, plus launching ramps at Tims Ford State Park, Tims Ford Marina, and Holiday Marina. These are designed to provide parking for approximately 295 vehicles and trailers. On-site observation during the three major summer holiday periods revealed that most, if not all, available established parking spaces at the Public Access Areas are full, and additional overflow or illegal parking areas are used as well. There are also private ramps and old road beds (which serve as informal launch ramps) leading into the reservoir. Thus, the actual number of vessels may be twice the number of available parking spaces.

Carrying capacity, with respect to water-based recreation, is the capability of a waterway to provide an opportunity for certain types of satisfactory and safe experiences over time without significant degradation of the resource. The concept of Optimum Capacity, i.e., "the appropriate level of use based upon resource and social capacity considerations, management objectives, safety and other factors," (National Water Safety Congress, 1996) was used in determining potential effects to water-based recreation.

### **3.10.2 ENVIRONMENTAL CONSEQUENCES**

The following information pertains to the environmental consequences surrounding the five Alternatives presented in this environmental document. Adoption of each of the alternatives could have both positive and negative effects on recreational opportunities.

In order to assess potential impacts on recreational boating opportunities, some basic assumptions were made using existing data. Boat traffic on the reservoir is assumed to originate from three major sources: 1) residential areas having water access, 2) public and informal boat ramps, and 3) marina slips. The amount of residential shoreline to account for vessels added due to residential development, parking availability at public boat ramps, and the amount of marina slips, were estimated to approximate potential increases in boaters for each alternative (see Table 3.10-1). The following assumptions were made.

1. Each residential shoreline mile could contain approximately 35 homes with private water-use facilities, including one power boat. This assumes that each lot would be 100 foot in average width plus another 50 foot for infrastructure, natural conditions, etc.
2. Using the parking area as a measure at public-use boat ramps and marinas, an additional 417 vessels can be expected on a major holiday. Due to the observed use of informal launching areas, private ramps, and illegal parking at public ramps, this number was doubled to 834, which is considered to err on the conservative side.
3. Twenty-five percent of boats from residences or stored at marinas could be in use during typical summer weekend days.

Even though the anticipated new residential development under Alternatives B, B1, and C would consist of group facilities only, the assumption above was used to provide an estimate of additional vessels being added to the reservoir. Obviously, many of the existing facilities could contain more than one vessel. This does not take into account the other homes in existing subdivisions that do not have direct water access but would have a need to use the reservoir facilities as well. Additionally, the analysis included the assumption that existing areas of residential development would be fully developed, with private water-use facilities.

For Alternatives B, B1, and C (and possibly A), two parcels were identified as possible locations for relocation and/or expansion of existing marinas. Determination of exact location, size, number of slips, harbor limits, etc. would be necessary before actual impacts to carrying capacity could be assessed. For analysis purposes, it is assumed that each expansion would add approximately 100 slips, for a total of 200 additional slips. This is based on the recent expansion at Tims Ford Marina of 90 slips.

Effects associated with each alternative were identified based on additional or lost recreational opportunity, estimating long-term changes in facility demand, and evaluating changes to the recreational experience.

**Table 3.10-1 Projected Cumulative Increase in Recreation Boating by Alternative**

Characteristic	Existing Condition	Alternative				
		A	B	B1	C	D
Miles of residential shoreline	52.4 (19%)	52.4 - 90.1 (19 - 33%)	65.5 (24%)	63.0 (23%)	90.1 (33%)	52.4 (19%)
Vessels in use from residential development	459	459 - 788	573	1,153	788	459
Vessels launched from ramps or other areas	834	834	834	834	834	834
Vessels in use from marina slips	71	71 - 121	121	121	121	71
Total potential vessels	1,364	1,364 - 1,743	1,528	2,108	1,743	1,364
Surface area per boat* (acres)	7.8	6.1 - 7.8	7.0	5.1	6.1	7.8
Projected increase in boats (percent)	0%	0 - 28%	11%	35%	28%	0%

\* Tims Ford has 10,680 acres of surface area.

#### **Alternative A**

Under this alternative, existing allocations for recreational use would continue. This currently includes only a few existing sites with narrowed boundaries designated for recreational purposes. The total area dedicated to recreation under this alternative would be approximately 279 acres. However, decisions would be made on a case-by-case basis for the 6,453 acres of plannable land. No comprehensive plan for developing recreation exists under this alternative. The number of sites and the acreage dedicated to recreational uses are likely to increase as both agencies review needs for additional recreational opportunities.

For Alternative A, there are 52.4 miles of existing residential shoreline, and a maximum of 37.7 miles could be added on a case-by-case basis. This could increase the number of residential lots by 1,319. Additionally, 200 marina slips could be added from proposed marina facility expansions. Numbers of boats on the reservoir at any given time could increase slightly under Alternative A as the residents of existing developed areas continue to invoke rights for private water-use facilities. However, it could



potentially increase by as much as 28 percent (see Table 3.10-1) as development is approved on a case-by-case basis.

The cumulative effects associated with implementation of Alternative A are as follows. All recreational day use areas would continue to be available. Parking and other facilities that support these areas would also remain. Over the long-term (0 - 25 years), this alternative could result in cumulative impacts. Approximately 297 acres being available potentially for future recreational opportunities; however, the majority of land adjoins existing recreational areas which limits the possible uses. It is also anticipated that residential lots would increase under this alternative; therefore, the number of personal watercraft vessels would likely increase, which without proper planning could be detrimental in the long term.

### **Alternative B**

If Alternative B were adopted, the eight Public Recreational Use Areas (boat ramps, courtesy water-use facilities, restrooms, picnic areas) would continue to exist, and most of the property surrounding these sites would be proposed as a public recreational park area. Thus, this alternative provides for the creation of additional recreational opportunities other than water-based activities. Through this alternative, approximately 576 acres would be directly available for recreational use.

Under Alternative B, parcels 76 and 32 would be designated as future recreational lands. Both tracts have significant topographical and reservoir frontage features that make them suitable for developed public recreational areas. Parcel 76, with 2.2 miles of shoreline and containing 131.5 acres, is unique in that it could be used to expand the existing campground and day-use areas. Parcel 32 has 1.1 shoreline miles and 89.3 total acres. It is conducive for future water-based recreational purposes.

Another important recreational area is Parcel 79, the Dry Creek Public Recreation Use Area. This site contains 27.6 acres with 0.6 miles of shoreline. Although some recreational activities are already taking place (beach, boat ramp), this site is not being used to its full potential. The topographical lay of the land and proper balance of open space and forested areas create a site ideal for development into a high use recreational area.

Alternative B would also allow for the expansion of the existing Winchester City Park. The addition of Parcel 80 would add approximately 26.4 total acres and 1.3 shoreline miles to the 55-acre park site.

Parcel 11 would be added to Tims Ford State Park. Parcel 11 adds a small portion, 9.3 acres at the northern end of Ross Branch Creek area, to complete the State Park system around that particular cove. Parcel 19, which encompasses 45.8 total acres and 0.9 shoreline miles, is being allocated for recreational use for possible future expansion of the existing privately-owned marina.

Parcel 42 would be allocated as Zone 4 (Natural Resource Conservation), and Parcels 41 and 43 would be allocated to Zone 3 (Sensitive Resource Management) Sensitive Resource Management. The resulting primary recreational opportunities are considered to be extremely low-impact and passive recreational use. In summary, this alternative would allow for substantial expansion of public and commercial recreational facilities to help meet long-range recreational needs while maintaining natural, undeveloped conditions along a substantial portion of the Tims Ford shoreline. This would ensure attractive conditions for both active and more passive forms of recreation. For these reasons, the selection of this alternative would be beneficial to recreation.

The proposed additional 13.1 miles of residential shoreline would result in approximately 458 new residential waterfront lots, for a total of 2,292 residential lots on Tims Ford Reservoir. The proposed marina facilities could increase the number of boat slips by 200. This could potentially increase the recreational boating activity on the reservoir by approximately 11 percent (see Table 3.10-1).

Under Alternative B, as much as 576 acres could be directly available for recreational use with several new parcels held strictly for recreational purposes. All existing facilities would continue to operate as normal as well as providing for additional recreational opportunities (hiking, picnicing, camping, etc.) for the next twenty-five years. Comprehensive planning is vital to this alternative. Additionally, residential

waterfront lots will increase under this alternative, but with a proper planning process, group watercraft storage, and the potential for two new marinas would lessen the impact caused by personal watercraft storage. However, under this alternative watercraft usage on Tims Ford Reservoir would increase. Under this alternative no adverse cumulative effects are noted.

**Alternative B1**

If Alternative B1 were adopted, all existing and proposed recreational areas/sites will remain as identified in Alternative B. However, 51 sites originally contained in Zone 4 (Natural Resource Conservation) have been classified as Zone 8 (Conservation Partnership). These 51 sites consist of 9.0 shoreline miles and 33 acres and are primarily designed to allow for shoreline protection and community boat facilities. Under this proposal, community water-use facilities would be designed based upon a site specific review, (not to exceed 2,000 square feet); however, launching ramps could be considered as well. If a 2,000 square foot facility is used as a basis for analysis, and considering that each slip in that facility would be based on a 10- by 20-foot area, a minimum of 10 watercraft could be placed at each of the 51 Zone 8 areas. Additionally, seven parcels are large enough to be considered for two community water-use facilities. This could mean an increase of 580 new watercraft in addition to the 573 previously identified in Alternative B; this totals 1,153 vessels in use from residential development. These 1,153 vessels along with the 834 vessels identified as being launched from ramps or other areas and along with the 121 vessels in marina slips, totals 2,108 vessels that are in use at any one time. This is a 35 percent increase from the existing conditions and reduces the overall surface area per boat to 5.6 acres. Again, under this alternative personal watercraft usage will increase, and the use of proper planning and safety precautions would minimize boating hazards. Increased boat usage could lead to increased shoreline erosion and reduce water quality.

**Alternative C**

If Alternative C were adopted, approximately 60 percent of the total acreage available could be used for residential development and perhaps some commercial development. Adoption of Alternative C may be detrimental to the expansion of the existing recreational opportunities and the creation of new ones. Many prime tracts suitable for future recreational and conservational uses would be lost. The concentration of hundreds of new homesites and the addition of thousands of new residents in the Tims Ford Reservoir area could, over time, further degrade the current and potential public recreational areas. This could eventually reduce the value of Tims Ford Reservoir as a tourism and public recreational resource.

The potential impact of Alternative C on recreation could be mitigated through the promulgation of a Park-Land Dedication Ordinance by the County(ies) and/or jointly with the municipalities. This ordinance would require developers to set aside adequate property (size and suitability) in all Planned Unit Developments (PUD) that would be developed into park areas. Such an ordinance could also provide the opportunity for the County/City to accept the cash value for potential park sites from the developers in order to set aside the money for recreational purposes. The development of this type of ordinance could be considered for Alternative A, B, B1, or C.

The acres attributed to recreation under Alternative C are the same (576) as under Alternative B. However, there would be basically no possibility of increasing this amount in the future, and the type of recreation could be significantly changed. Thus, the selection of this alternative would result in a significant reduction in potential public recreational benefits on Tims Ford Reservoir.

Under Alternative C, the proposed additional 37.7 miles of residential shoreline would eventually result in approximately 1,319 new residential waterfront lots. This would result in a total of 3,153 residential lots on Tims Ford Reservoir. The proposed marina facilities could increase the number of boat slips by 200. This could potentially increase the existing boating activity on the reservoir by approximately 28 percent (Table 3.10-1).

Alternative C was developed to provide a high level of residential/commercial development. The existing recreational areas would continue to operate as normal but with no room for land expansion and additional recreational opportunities. With this alternative, at least a 28 percent increase in projected personal watercraft usage can be expected due to the intense development of new residential property. Many

prime tracts of land will be lost for recreational development during the next twenty-five years, which would result in residents demanding additional recreational opportunities; however, the land base necessary to create such opportunities will have been eliminated. This alternative would likely have adverse cumulative effects on recreation.

The acres attributed to recreation under Alternative C are the same as under Alternative B. However, there is basically no possibility under this alternative of increasing this amount in the future, as there would be under Alternative B, and the type of recreation could be changed.

#### **Alternative D**

Alternative D allows for preservation and protection of vital and sensitive resources in the region. However, only 279 acres are dedicated for recreational purposes under this alternative. This is nearly a 50 percent decrease from Alternatives B and C. Although Alternative D does restrict the initial acreage, through proper planning and mitigation, many of these parcels (3, 12, 19, 23, 27, 32, and 79) might well be used for future passive recreational opportunities. Although this alternative would maximize opportunities for the more passive forms of outdoor recreational use, its adoption would constrain opportunities for meeting long-term needs for water-based recreation and tourism facilities on Tims Ford.

No new development is proposed under Alternative D. Thus, the level of recreational boating activity is expected to increase slightly as residents of the existing developed areas continue to obtain permits for private water-use facilities. However, adoption of Alternative D would not directly cause increases in boating activity.

Alternative D was developed to provide a high level of natural resource and sensitive resource management. Under this alternative all existing recreational opportunities would continue to exist. However, the number of new acres specifically set aside for recreational purposes will be reduced by about half. In addition, the residential development would also be greatly reduced, thus creating less demand for traditional high use recreational opportunities including personal watercraft during the next twenty-five years. Many of the tracts designated for natural resource management could be used for passive recreation (i.e., hiking, horse back riding, primitive camping, etc.) although there is no guarantee this would happen. This alternative is viewed as having no adverse or positive cumulative effects upon the recreation spectrum.

#### **Conclusion**

Tims Ford Reservoir and the surrounding lands afford various recreational opportunities. Much of the demand for recreation centers on water-based activities, such as boating. Demand for water-based recreational opportunities is likely to increase as residential areas around the reservoir increase. Other, non- water-based recreational opportunities, such as hiking, camping, etc. would tend to decrease with increasing residential development.

Thus, adoption of Alternative D, which does not tend to promote extensive residential or commercial development, would extend opportunities for passive, non-water-based recreation. Obviously, alternatives that promote residential development (i.e., Alternatives A, B, B1, and C) would likely cause increased levels of boating activity. Because Tims Ford is a popular reservoir, recreational boating levels could reach or exceed carrying capacity. Such increases in boating activity are not likely under Alternative A or D.

### **3.11 VISUAL**

#### **3.11.1 AFFECTED ENVIRONMENT**

Tims Ford Reservoir was constructed just downstream of Woods Reservoir near the headwaters of the Elk River. It lies west and in sight of the lower Cumberland Mountain range amid rolling dairy pasture lands and sections of low-lying ridges. The vegetative cover surrounding the reservoir varies from sage fields to hardwood forests. Most typical of the reservoir's shoreline is hardwood timber cover spotted with

pockets of cedar and pine. Much of the surrounding countryside is composed of farmland which is being used predominately for livestock and dairy production.

Tims Ford supports a variety of residential developments. Additionally, the towns of Winchester and Estill Springs consume portions of its shoreline. Homes built along the shoreline vary from cabins and second homes to large, upscale permanent residences. These developments exist on open, cleared countryside as well as on steep, heavily wooded ridges. There appears to be a fairly even distribution of development around the reservoir shore with only a few areas of reservoir surface that are not in view of a subdivision or individual shoreline home. Only one major commercial marina is located on the reservoir. It is at a central location adjacent to Tims Ford State Park and serves the public with in-water boat storage and boat sales. A number of parks, campgrounds, and boat launching facilities can also be seen at various points serving the public with reservoir access. Scenic Highway 50 passes through the Tims Ford Reservoir area and the dam reservation.

Water towers, transmission line crossings, and bridges are among the more noticeable manmade features in the visual landscape of the reservoir. Residential development, with its associated water access facilities (water-use facilities, boat houses, and access steps and walks), make up the greatest portion of manmade facilities that create a visual departure from a natural reservoir setting. However, there are some coves and creek embayments with undeveloped natural surroundings available to boaters and fishermen. The criteria used for visual assessment are included in Appendix E. USDA Forest Service (1974) methodology was used in the visual analysis.

### **Variety Classes**

Variety classes are obtained by classifying the landscape into different degrees of variety. This determines those landscapes which are more important and those which are of lesser value from the standpoint of scenic quality. The classification is based on the premise that all landscapes have some value, but those with the most variety or diversity have the greatest potential for high scenic value. There are three variety classes which identify the scenic quality of the natural landscape:

**Class A - Distinctive** - This class applies to those areas where features of landforms, vegetative patterns, water forms, and rock formations are of unusual or outstanding visual quality. They are usually not common in the character type.

**Class B - Common** - This class includes those areas where features contain a variety in form, line, color, and texture or combinations thereof but which tend to be common throughout the character type and are not outstanding in visual quality.

**Class C - Minimal** - Those areas whose features have little change in form, line, color, or texture are considered Class C. This class also includes all areas not found under Classes A or B.

### **Sensitivity Levels**

Sensitivity levels are a measure of people's concern for the scenic quality of the landscape. Sensitivity levels are determined for land areas viewed by those who are traveling through the countryside on developed roads; are residents of the area; or are recreating at reservoirs, streams, and other facilities. Therefore, some degree of visitor sensitivity will be established for the entire land base. Three sensitivity levels are employed. Each represents a different level of user concern for the visual environment.

**Level 1** - Level 1 includes all areas seen from primary travel routes, use areas, and water bodies, existing and proposed, where at least one-fourth of the viewers have a major concern for the scenic qualities. Highly sensitive communities, such as one where a large portion of the population is not directly related to performing the farming activities characteristic of the area, would also be assigned to Level 1.

Level 1 - This level includes all areas visible from secondary travel routes, use areas, and water bodies (existing and proposed) where at least three-fourths of the viewers have a major concern for scenic qualities. All roads leading directly to major areas of interest, recreational composites, and historic sites, in addition to roads classified as "Scenic Highways," are to be assigned Sensitivity Level 1.

Level 2 - This level includes all areas seen from primary travel routes, use areas, and existing and proposed water bodies, where fewer than one-fourth of the viewers have a major concern for scenic qualities.

Communities where a large portion of the population is directly related to performing farming activities would be included at this level. Level 2 includes all areas seen from secondary travel routes, use areas, and existing and proposed water bodies, where at least one-fourth and not more than three-fourths of the viewers have a major concern for scenic qualities. Examples are all roads leading directly to secondary areas of interest, recreational composites, and historic sites. Sensitivity Level 2 does not include travel routes and use areas of only occasional visitation.

Level 3 - Level 3 includes all areas seen from secondary travel routes, use areas, and water bodies where less than one-fourth of the viewers have a major concern for scenic qualities. Level 3 does not include any areas seen from primary routes or areas. Examples are areas seen from secondary travel routes receiving only occasional use and land areas not visible from any travel route, use area, or water body.

### **3.11.2 ENVIRONMENTAL CONSEQUENCES**

#### **Alternative A**

The Visual/Aesthetic quality of the reservoir could change under this alternative, depending on the type and amount of development that could occur. No lands suitable for development would be set aside for resource protection. Proposals for development would be subjected to individual land-use reviews. Scenic quality would more than likely suffer. Future public and political pressures could become determining factors in the types of and places at which development would occur. The visual/aesthetic resource could be significantly impacted.

#### **Alternative B**

Under this alternative, parcel designations would more accurately predict future changes in the scenic quality of Tims Ford Reservoir. Both the public and the current residential land owner would have some idea of what might occur on any particular parcel in the future. While some parcels would be placed into sensitive resource management and resource conservation, others would be designated for residential and recreational development. Approximately 816 acres of undeveloped project land would be allocated for future homesites, and 297 acres would be designated for recreational access to the reservoir. Under this alternative the increases in auto and boat traffic, the added rights-of-way for required infrastructure, and the potential loss of approximately 20.5 miles of undeveloped shoreline would significantly affect the visual resource of Tims Ford Reservoir.

#### **Alternative B1**

Under Alternative B1, the addition of Zone 8 would allow community water-use facilities and would have some visual effects on Tims Ford Reservoir. One of the greatest visual resources on Tims Ford Reservoir is found in the Little Hurricane and Owl Hollow Creek embayments. These coves have no residential development and offer the boater and reservoir recreator an area centrally located on the reservoir as a destination point out of sight of development. Although, the locations of the proposed Conservation Partnership zones should not affect these areas, there would, however, be some cumulative visual impacts associated with the addition of Zone 8. However, the construction of water-use facilities would not create a visual departure from the existing setting in these sections of the reservoir. Impacts would result from increased levels of boat traffic as launched boats could be more easily left at community water-use facilities and more frequently used. By permitting more water-use facilities along the Tims Ford shoreline due to the creation of Zone 8, more backlying residential development could occur on adjoining private land which will generate the need for more infrastructure. This infrastructure with its associated rights-of-ways, roadways, and support structures will have a cumulative negative visual impact on the aesthetic resource of the Tims Ford area.

**Alternative C**

Under a planned maximum land development alternative, approximately 2,585 acres of public land could be developed for residential and recreational purposes. Approximately 55.1 miles of natural shoreline could potentially be changed by development. The general visual quality of the reservoir that currently exists would be significantly impacted. Overcrowded conditions and a reduced number of undeveloped coves available to the boater for fishing and anchoring would likely be the result of adopting this alternative. Residential development, the presence of reservoir users, and the required infrastructure to support this development would be visually dominant.

**Alternative D**

Under Alternative D, no new development outside of existing uses would be allowed. That is, all lands would be unavailable for development and would be allocated to natural resource conservation. Large tracts of undeveloped shoreline would remain intact, which would preserve existing scenic resources for public enjoyment. Reservoir users and visitors to the Tims Ford area would be given a variety of scenic resources to experience under this alternative. Existing stretches of wooded shoreline as well as some coves and embayments would be preserved, absent of development. Subdivision development would be limited to existing designated tracts. Home owners and potential buyers of homes could be assured with some degree of certainty of the long-term views that they could expect. Visual quality around Tims Ford Reservoir would benefit from adoption of this alternative.

**3.12 OTHER ISSUES****3.12.1 AIR QUALITY****3.12.1.1 AFFECTED ENVIRONMENT**

The Clean Air Act empowers the U. S. Environmental Protection Agency (EPA) to establish rules and regulations to protect the nation's air quality. Under this authority, the EPA has set primary and secondary ambient air quality standards for six criteria pollutants: carbon monoxide, lead, nitrogen dioxide, ozone, particulate, and sulfur dioxide. These standards are designed to protect the health and welfare of citizens.

Historical air quality data gathered within the State of Tennessee indicate that Moore, Franklin, and the surrounding counties are in attainment with ambient standards.

In 1997, the EPA revised the standards for two of the criteria pollutants, ozone and particulate, to more restrictive levels. When the state's air quality data are evaluated under the new standards in the designated years of 2000 and 2002, some counties may not be in attainment with these new standards. However, because Moore and Franklin Counties are considered rural areas, air quality in these counties is unlikely to exceed the new standards.

Prevention of Significant Deterioration (PSD) rules under the Clean Air Act protect air quality in national parks and Wilderness areas classified as Class I areas. During the permitting process, new or expanding sources within 31 miles of a Class I area must closely examine the impact of projected emissions on the area. Depending on the significance of the impact of the emissions, the permitting agency can approve or deny the permit. The Federal Land Manager can request that the review of the impacted area be extended to a distance greater than 62 miles beyond the boundary of a Class I area when considering large air pollution sources. The State's PSD permitting authority, Division of Air Pollution Control, works closely with the Class I Federal Land Manager during the PSD permitting process to resolve issues and concerns about potential air quality impact. However, in all cases, the state is the PSD permitting authority.

**3.12.1.2 ENVIRONMENTAL CONSEQUENCES**

For the alternatives considered in this FEIS, the allocation of lands to Industrial/Commercial Development and Residential Development has the potential to impact air quality. Other land uses (e.g., project operations, sensitive resource protection, natural resource conservation, and recreation) are not expected

to cause any significant effects to air quality. Potential affects associated with resultant recreation, industrial/commercial development, and residential development are described below.

**Recreation**

There would be an increase in emissions to the ambient air from increased usage of watercraft under Alternatives A, B, and C. However, this increase in emissions is not expected to impact the State of Tennessee's ability to meet ambient air quality standards in Moore and Franklin counties. The EPA has established standards for emissions for engines used in off-road applications such as watercraft. Manufacturers of engines used for this application are required to comply with these standards. As watercraft come into compliance with the standards, air emissions are not expected to be a problem.

**Industrial/Commercial Development**

Any significant air contaminant source that plans to locate or expand in the area will be required to file a permit application with the TDEC. The source must show compliance with the applicable air quality standards to be permitted. The PSD review will ensure that emissions from new industrial sources located in the project area (under any of the alternatives) would not adversely impact air quality in the Class I areas. Under Alternatives A and D, 6 acres (0.6 shoreline miles) would be allocated for industrial or commercial development purposes to accommodate existing land uses, which currently include a water intake (Parcel 7A) and an office building complex (Parcel 83). Under Alternatives A, B, B1, and C, 61 additional acres (1.2 shoreline miles) would be considered for industrial or commercial development purposes.

Tims Ford does not accommodate commercial navigation, as there is no navigation lock for the dam. Any new industrial/commercial areas under Alternatives A, B, B1, and C would consist of light commercial activities and would provide opportunities for community education facilities and for a staging area for commercial operators to assemble floating piers.

Under Alternative A, requests for any or all of the additional 61 acres would be considered on a case-by-case basis. Under Alternative D, no additional land would be allocated for Industrial/Commercial Development. Under Alternatives B, B1, and C, the likelihood of industries with significant air contaminant sources locating on Tims Ford project lands is very low. Therefore, potential impacts to regional air quality from commercial/industrial development are unlikely.

**Residential Development**

Under Alternatives A and D, 122 acres (17.1 shoreline miles) would be allocated for Residential Development/Access to accommodate existing licensed residential access. Under Alternative A, up to 2,585 acres could be considered for residential development on a case-by-case basis. Under Alternative B, 938 acres (30.2 shoreline miles), including existing licensed residential access, would be allocated for Residential Development/Access. Under Alternative B1, 821 acres (28.2 shoreline miles), including existing licensed residential access, would be allocated for Residential Development. Under Alternative C, 2,585 acres (64.9 shoreline miles), including existing licensed residential access, would be allocated for Residential Development. No additional land would be allocated for Residential Development under Alternative D.

Any potential impacts to air quality from residential development would be insignificant regardless of the alternative, as residential development typically has minimal effects on air quality. Emissions from the operation of construction equipment and fugitive dust from grading operations would be controlled effectively by following proper preventive maintenance schedules for equipment and applying reasonable precautionary measures to minimize fugitive dust. Once construction is completed, normal activities that take place in residential neighborhoods, such as space heating and the use of gas-powered equipment, would contribute some minor emissions. However, the overall impact on regional air quality from these sources would be negligible.

### 3.12.1.3 CONCLUSION

Potential impact on air quality under any of the alternatives depend on the type of development that takes place. Residential development would have very little impact. Commercial development will have a slight impact on air quality. The greatest potential impact is from industrial development. Because new and expanding industrial sources are regulated under state permitting requirements, anticipated effects on air quality will be within acceptable limits.

## 3.12.2 FLOODPLAINS

### 3.12.2.1 AFFECTED ENVIRONMENT

The 100-year floodplain on Tims Ford Reservoir is the area inundated by the 100-year flood. The 100-year flood elevation on Tims Ford is elevation 893.3 feet mean sea level (msl) at the dam (Elk River Mile 133.3). This elevation is used throughout the reservoir. The 500-year or "critical action" floodplain on Tims Ford is the area below elevation 894.2 feet msl. On Tims Ford Reservoir lands, all property below the 895-foot contour is retained by TVA. Thus, any actions that could potentially directly affect floodplains on project lands would be subject to jurisdiction by TVA.

### 3.12.2.2 ENVIRONMENTAL CONSEQUENCES

All property disposition and allocations involve property above elevation 895. The 100-year floodplain is below that elevation. Therefore, under any alternative, there would be no direct impacts to the 100-year floodplain. Indirect impacts on the 100-year floodplain that may result from activities associated with development such as the construction of private water use facilities are not expected be significant. For these activities, there is no practicable alternative to locating in the floodplain as determined by TVA in 1981 in the memorandum entitled "Class Review of Certain Repetitive Actions in the 100-Year Floodplain."

Under all of the alternatives, any fill material placed between elevations 860 feet msl and 888 feet msl would be subject to a charge for lost power storage, and any material placed between elevations 873 feet msl and 895.0 feet msl would be subject to the requirements of the TVA Flood Control Storage Loss Guideline. Those alternatives with additional residential and recreational development, such as Alternatives B, B1, and C, would likely generate several requests for dredge and fill activities each year.

## 3.12.3 TRANSPORTATION

### 3.12.3.1 NAVIGATION

#### **Affected Environment**

There is no commercial navigation on Tims Ford Reservoir; however, TVA installs and maintains navigational aids on land surrounding the reservoir to assist recreational boaters. There are 32 onshore day boards located at intervals on the Elk River between Tims Ford Dam and Elk River Mile 162.2 that provide boaters information on river miles. Where possible, the day boards are located so that boaters can travel in a straight line of sight from one day board to the next. Seventeen onshore directional signs mark the entrance of large creeks into the Elk River. Directional signs show the name of the creek and point in the upstream direction of the creek. Maintenance is performed once a year to replace missing or damaged navigational aids, and vegetation is removed from the immediate vicinity of the signs to ensure that they are visible to boaters. Navigational aids, either day boards or directional signs, are located on the shoreline of Parcels 12, 14, 20, 24, 28, 33, 34, 36, 38, 39, 41, 47, 51, 52, 54, 69, 73, 75, 76, and 79.

#### **Environmental Consequences**

Under all alternatives, there would be no significant impact on navigational aids used by recreational boaters. The main concerns are the continued placement of the signs along the shoreline and visibility of the signs. Because navigational aids are located along the shoreline, the construction of water use



structures associated with residential development or marinas would have the greatest potential for impacting navigational aids. Requests for water-use facilities, boathouses, fishing piers, and launching ramps within 50 feet of navigational aids would be reviewed by TVA's navigational program during the Section 26a permitting process. The Section 26a permit process would ensure that water-use structures constructed along the shoreline would not reduce visibility of the signs or compromise their placement on the shoreline. Industrial and commercial developments that do not involve the placement of structures in the reservoir would have no impact on navigational aids.

### 3.12.3.2 AUTO TRAFFIC

#### Affected Environment

Primary access to the project lands is via State Route 55 from the northwest or U. S. Highway 64 from the southeast. Route 55 and Highway 64 are 4-lane principal highways from Tullahoma and Winchester, respectively, to Interstate 24, which is approximately 18 miles to the east of the project lands. Route 55 merges with State Route 50 northwest of the Plan area and continues westward into Fayetteville. Highway 64 continues westward and merges with Route 50 just west of Fayetteville about 15 miles west of the Plan area.

Several roads traverse the Plan area between Route 55 and Highway 64, including U. S. Highway 41A, State Route 50, State Route 130, and Mansford/Awalt/Chestnut Hill Roads. These roads serve as connector and feeder routes to the primary access roads. Highway 41A is a 4-lane roadway in the developed urban areas and a high-quality 2-lane route with good shoulder width and alignment in rural areas. Routes 50 and 130 are high- to mid-quality 2-lane secondary roadways. The Mansford to Awalt and Mansford to Chestnut Ridge routes are 2-lane secondary roads with often limited sight distance and sometimes little to no shoulder width. Numerous smaller county roads lead from these connector roads to the individual project lands.

The average daily traffic (ADT) counts for the primary and connector roads are shown in Table 3.12-1. ADT values were taken from "Tennessee City & County Traffic Maps showing 1997 Average Daily Traffic" by the Tennessee Department of Transportation. Some existing significant traffic generators for the area include the AEDC to the northwest, the Nissan production facility to the northeast, and the industrial park to the east. The AEDC connects to State Route 55. Both the Nissan facility and the industrial park access Highway 64.

**Table 3.12-1 Existing ADT Count for Roads Surrounding and Traversing Plan Area**

Road	Description	Existing ADT
Highway 64	Mixed 4-lane & high quality 2-lane, US highway	3,800
Route 55	Mixed 4-lane & high quality 2-lane, State route	13,600 (to I-24) 6,390 (2-lane)
Route 130	High to mid quality 2-lane, State route	5,070
Route 50	High to mid quality 2-lane, State route	1,770
Highway 41A	Mixed 4-lane & high quality 2-lane, State route	12,130
Mansford & Awalt	2-lane, limited shoulder & sight distance	1,850 & 1,530
Mansford & Chestnut Ridge	2-lane, limited shoulder & sight distance	1,850 & 840

#### Environmental Consequences

The alternatives for the Tims Ford Project land include a wide range of possible land uses in the development of the area. The alternatives have many parcels allocated to land-use zones which could include industrial and commercial development, developed recreation, and residential development. These types of development would result in the generation of additional traffic on the adjacent roadway

network. The methodology, as defined by Trip Generation, used to determine the additional trip generation estimates is based on an independent variable (acreage) for each particular land use for a specified day or time period (weekday). Based on several field studies of existing recreational homes, marinas, parks, golf courses, light industry, manufacturing, industrial parks and warehousing, estimates of vehicle trip ends or vehicles per day were used to determine how the existing traffic would be affected. The project area was divided into sectors using existing population and average daily traffic data to determine traffic flow direction of the expected generators.

The additional traffic due to the proposed alternatives would result in increases in average daily traffic as shown in Table 3.12-2. This level of analysis provides a broad overview of the predicted impact. The state multi-lane highways (Highway 64 and Route 55 to I-24) would provide higher capacity levels and an increase in traffic would tend to be less noticeable. Although some of the percentage increases in ADT are rather high, the roads in this area are generally underutilized and an increase in traffic will not result in a major change to the existing service levels of the local roads. The secondary connector and feeder routes have existing traffic conditions where there is stable flow, but drivers are restricted in their freedom to select speed. In some cases, the additional traffic generated would result in a noticed traffic flow that becomes subject to considerable and sudden variation and reduced freedom to maneuver, but operating speeds remain tolerable for short periods of time. The numerous smaller county roads that lead to the connector roads would experience large increases in traffic volume. Also, some parcels to be developed do not have access. These roads which lead to the connector roads may have to be upgraded, and new roads may have to be developed for the traffic conditions expected. Over a long period of time, there is a natural progression to improve the quality of the local roadway network. Therefore, as traffic increases, roadway networks would also improve. Also, the increases in traffic will occur slowly over a long span of time, so that traffic conditions will not change suddenly and will not be perceived by the user as a significant change. Users of the local roadway network tend to be multi-users of the entire Tims Ford Project land area. Some of the future traffic projected would likely be entirely self contained within the project area (i.e. a trip from a nearby recreation home to the local golf course). Such traffic occurs typically at an off-peak hour and as such does not generally affect road users commuting through the project area.

**Table 3.12-2 Average Daily Traffic Increases for Roads Surrounding and Traversing Plan Area**

	Existing	Alternative				
Road	ADT	A	B	B1	C	D
Highway 64	3,800	5%	14%	14%	18%	10%
Route 55	13,600	1%	3%	3%	5%	1%
	6,390	5%	30%	30%	48%	7%
Route 130	5,070	6%	27%	27%	41%	8%
Route 50	1,770	40%	180%	180%	225%	125%
Highway 41A	12,130	2%	5%	5%	6%	3%
Mansford	1,850	2%	46%	46%	54%	2%
Awalt	1,530	12%	82%	82%	95%	21%
Chestnut Ridge	840	2%	2%	2%	2%	2%

Increases in traffic due to the dedicated land uses of Alternative A are relatively small. Most of the parcels for this alternative, though, have yet to be zoned and will be evaluated on a case-by-case basis. Adoption of Alternative D also would have relatively small increases in traffic due to no additional development. Alternatives B, B1, and C both have noticeable effects on the roadway system; however, Alternative C has the greatest overall increase in traffic conditions due to the maximum economic growth philosophy. Alternative B has a balanced approach between that of development and conservation and increases to the roadway network are less than those under Alternative C. Alternatives B and B1 will be similar in average daily traffic increases, although community facilities under Alternative B1 could cause small traffic

increases as compared to Alternative B. Changing Parcel 14 from Zone 7 to Zone 4 reduced ADT increases on State Route 50.

Possible mitigative efforts that could be made to improve traffic would likely be made over time by the appropriate county highway department. Physical improvements to increase road capacity could include intersection redesign, construction of additional vehicle lanes throughout road segments, construction of passing lanes in certain locations, realignment to eliminate some of the no-passing zones, increased shoulder width, etc. New roads that would be constructed for access that lead to the secondary connector roads would likely be designed based on detailed field studies to assure adequate traffic conditions.

The potential traffic impact for all four alternatives would be insignificant. Implementation of Alternatives A or D would generate very small percentage increases in traffic as compared to the existing ADT. Under these two alternatives, the additional traffic would not reduce the level of service currently provided by the local road network. Alternative C shows the highest percentage increases in traffic. Overall the road network has sufficient capacity to handle the additional traffic for this alternative, albeit at some count locations this will be at a level of service reduced from that currently provided. Given the time over which development will take place, the increase in tax base due to the development, and the nature of the traffic increase, it is likely that mitigative measures would naturally be taken by the appropriate transportation authorities involved. Similarly, the traffic generated under Alternative B and B1 can be handled by the existing road network with the level of service slightly reduced at only a few locations. The mitigative efforts mentioned above would again tend to offset this increase.

### **3.12.4 SOCIOECONOMICS**

#### **3.12.4.1 AFFECTED ENVIRONMENT**

The Tims Ford Reservoir lies in Franklin and Moore Counties in lower middle Tennessee, near to the Tennessee-Alabama state line.

##### **Population**

The 1998 population of the two counties in the Tims Ford area is estimated by the U. S. Bureau of the Census to be 42,723, an 8.1 percent increase over the 1990 population of 39,511. This growth rate is slower than that of the state, which is estimated to have grown by 11.3 percent. Table 3.12-3 shows the population and population projections for Franklin and Moore Counties and how they compare to both the state of Tennessee and the U. S. There are 1,968 lots that have been platted in subdivisions or other private developments around Tims Ford Reservoir, not all of which have been developed. Over half (1,063) of these are waterfront lots. If all these lots were developed and used as full-time residential units, the total population impact on the area around the reservoir would likely be about 5,300 persons, including more than 2,800 living on waterfront lots.

**Table 3.12-3 Population and Population Projections 1980-2010**

County	1980	1990	1998	2005	2010
Franklin	32,075	34,798	37,458	39,537	41,076
Moore	4,519	4,713	5,265	5,536	5,735
Area Total	36,594	39,511	42,723	45,073	46,811
Tennessee	4,591,023	4,877,203	5,430,621	5,966,000	6,180,000
United States (000)	226,542	248,710	270,029	285,981	297,716
<b>Percent Change In Population</b>					
County	1980-1990	1990-1998	1990-2005	2005-2010	1998-2010
Franklin	8.5	7.6	13.6	3.9	9.7
Moore	4.3	11.7	17.5	3.6	8.9
Area Total	8.0	8.1	14.1	3.9	9.6
Tennessee	6.2	11.3	22.3	3.6	13.8
United States	9.8	8.6	15.0	4.1	10.3

Source: U. S. Bureau of the Census, Census of Population; Woods & Poole.

### Labor Force and Unemployment

In 1999 the civilian labor force of the area was 21,170, as shown in Table 3.12-4. Of those, 890 were unemployed, for an unemployment rate of 5.2 percent. Moore County's unemployment represented 2.4 percent of its labor force while Franklin's represented 4.5 percent. The unemployment rate for the combined two counties, 4.2 percent, was above the state rate, 4.0 percent, yet higher than that of the nation, 4.9 percent. Franklin County's rate was higher and Moore County's lower than both the state and national rates.

**Table 3.12-4 Labor Force Data, Residents Of Tims Ford Area, 1997 Annual Average**

County	Civilian Labor Force	Employment	Unemployment	Unemployment Rate
Franklin	18,240	17,420	820	4.5
Moore	2,930	2,860	70	2.4
Area Total	21,170	20,280	890	4.2
Tennessee	2,818,800	2,705,300	113,500	4.0
United States	139,368,000	133,488,000	5,880,000	4.2

Source: Tennessee Department of Employment Security; U. S. Bureau of Labor Statistics.

### Jobs

The number of jobs in the Tims Ford area has risen fairly steadily over the past several years. In 1996 the area's total wage and salary employment was about 12,000, an increase of 21.2 percent since 1989. About 87 percent of these jobs were in Franklin County.

In 1996 manufacturing industries accounted for about 16 percent of the Tims Ford area's wage and salary jobs. However, in 1989 manufacturing accounted for about 26 percent of the jobs. The number of manufacturing jobs declined during this period in both counties. The service sector was the area's largest employer, providing around a third of the area's wage and salary employment. The service sector experienced an employment increase of almost 44 percent between 1989 and 1996.

### Occupation Patterns

While Franklin County has a higher proportion of its workers in managerial and professional jobs than the state average, Moore County's share is lower. The combined counties' share is 19.4 percent, compared to 22.6 percent statewide. Conversely, the area has a higher share of its workers in the lower-paying, blue-collar jobs. While the shares in Franklin County are somewhat similar to the statewide averages,

Moore County has proportionally fewer managerial and professional workers and more lower-skilled, blue-collar workers.

**Income and Retail Sales**

Per capita personal income in the area increased by 10.6 percent between 1989 and 1996. This increase was less than the 14.7 percent increase experienced by the state of Tennessee but greater than the 8.1 percent national increase. The per capita income of area residents in 1996 was \$15,917, a level significantly below either the state or national levels, \$20,037 and \$22,223, respectively. Franklin County's per capita income of \$16,114 is somewhat higher than that of Moore County, which is \$14,526.

The manufacturing sector currently generates 18.6 percent of the area's earnings by place of work, about the same as the national average of 18.0, but below the state average of 22.5 percent. In Franklin County 18.5 percent of earnings are generated from manufacturing while in Moore County the share is 19.4 percent.

**Housing**

Based on 1990 median values of owner-occupied homes, housing prices are generally lower than elsewhere in the state. Franklin County's median housing value was \$48,700, while Moore's was slightly higher at \$50,300. The median value of housing in the state of Tennessee was \$58,000 in 1990.

### 3.12.4.2 ENVIRONMENTAL CONSEQUENCES

Under all the alternatives, socioeconomic impacts would result largely from the use of land for recreational, industrial or commercial, and residential use. Alternatives A and D include 6 acres with approximately 0.6 shoreline miles available for industrial or commercial development purposes. Alternatives B and C include 67 acres and approximately 1.8 shoreline miles for industrial or commercial development purposes.

**Alternative A**

Socioeconomic impacts would result largely from the use of land for recreational use, for industrial or commercial use, and for residential use. Under Alternative A, 6 acres with about 0.6 shoreline miles are allocated for industrial or commercial development purposes to accommodate existing land uses. Additional lands could be utilized for Recreational or for Residential Development; roughly 2,821 acres could be used for this purpose (not including an additional 123 acres with 52.4 miles of shoreline, which are existing residential land and would likely be considered for residential access). These uses would likely result in significant impacts to the local economy.

**Alternative B**

Under Alternative B, 67 acres with about 1.8 shoreline miles would be classified as Industrial or Commercial Development to accommodate existing land uses and light commercial development. The light industrial development consists of an existing office building complex and a staging area for assembling boat water-use facilities. Also under Alternative B, 576 acres with approximately 13.8 miles of shoreline would be available for Recreation. Depending on the type of development, there could be an important impact on the local economy if persons from outside the local area are drawn to this development. However, the impacts cannot be assessed with specificity in the absence of proposals for recreational development. Residential development could also result in important impacts on the local economy. This alternative allocates 938 acres (30.2 shoreline miles), in addition to existing licensed residential access, for Residential Development. Using the assumptions in TVA's Shoreline Management FEIS (TVA, 1998), this could result in increased population in waterfront lots of about 1,800 persons. In addition, backlying lots might be developed for residential use, resulting in an increase of another 2,200 persons. While much of this population would consist of persons who would otherwise live elsewhere in the general area, developments that are well designed and marketed regionally or nationally would attract some residents from other areas, particularly retirees.

**Alternative B1**

Under Alternative B1, the socioeconomic impacts would be very similar to those of Alternative B. Compared to Alternative B, there are 117 fewer acres allocated to Zone 7 (Residential Development/Access) and 87 more acres allocated to Zone 4 (Natural Resource Conservation), along with the addition of a new Zone 8 (Conservation Access) which is coupled with a new management strategy to establish a wider shoreline buffer zone in certain areas. These changes are discussed in Section 2.2.3. Most of the changes in the acreage allocated to Zones 4 and 7 result from moving Parcel 14 which has 128 acres from Zone 7 (Residential Development/Access) to Zone 4 (Natural Resource Conservation). This change would likely reduce the population increase along the reservoir, but the difference would not be important in the overall context of population, income, and employment in the area. These changes, however, would have positive impacts on property values around the reservoir. Property values would be expected to be somewhat higher than under Alternative B for three reasons. First, Alternative B1 would provide opportunities for water access via community water-use facilities for residential units that otherwise would have no water access. Next, it would provide better views and improved attractiveness in some important parts of the reservoir. Finally, it would slightly reduce the number of residential lots that could potentially become available on the reservoir.

**Alternative C**

Under Alternative C, as under Alternative B, the same 67 acres with about 1.8 shoreline miles would be classified as Industrial or Commercial Development to accommodate existing land uses and light commercial development. The light industrial development consists of an existing office building complex and a staging area for assembling boat docks. Also under Alternative C, as under B, 576 acres with approximately 13.8 miles of shoreline would be available for Recreation. Depending on the type of development, there could be an important impact on the local economy if persons from outside the local area are drawn to this development. However, the impacts cannot be assessed with specificity in the absence of proposals for recreational development. Residential development could also result in important impacts on the local economy. This alternative allocates much more land to residential development than any of the other alternatives. 2,585 acres (64.9 shoreline miles) in addition to existing licensed residential access would be designated as Residential Development/Access. Using the assumptions in TVA's Shoreline Management FEIS (TVA, 1998), this could result in increased population on waterfront lots of about 3,700 persons. In addition, backlying lots might be developed for residential use, resulting in an increase of another 4,600 persons. While much of this population would consist of persons who would otherwise live elsewhere in the general area, developments that are well designed and marketed regionally or nationally would attract some residents from other areas, particularly retirees.

**Alternative D**

Under Alternative D, as under Alternative A, 6 acres with about 0.6 shoreline miles would be classified as Industrial or Commercial Development to accommodate existing land uses. However, under Alternative D, only 279 acres, with approximately 7.7 miles of shoreline, would be available for Recreation. Depending on the type of development, there could be an important impact on the local economy if persons from outside the local area are drawn to this development. However, the impacts cannot be estimated with specificity in the absence of proposals for Recreational Development. On the other hand, this alternative allocates no additional land for Residential Development other than the land that already is in or sold for residential use. Therefore, the only impact on population would be indirect impacts resulting from increased economic activity from recreational development, except for the possibility of minor impacts from light industrial or commercial development as discussed above. However, there are lots already sold for residential use that have not been developed. There would continue to be population impacts as these lots are developed, as there would be under any of the alternatives.

**3.13 ENVIRONMENTAL JUSTICE****3.13.1 AFFECTED ENVIRONMENT**

The nonwhite population in both Franklin and Moore Counties is a smaller share of total population than in the state as a whole. The poverty rate in both counties is also lower than the state average. The portion of

these counties in which the reservoir itself is located (Census tracts 9601, 9602, 9603, 9604, and 9605 in Franklin County, and 9901.98 in Moore County) also has nonwhite population shares and poverty levels below the state average. The nonwhite population share and the poverty level in this area are similar to Franklin County, but both are higher than in Moore County. The nonwhite population and percent of persons below the poverty level is shown in Table 3.12-5.

**Table 3.12-5 Nonwhite Population and Poverty Levels**

	<b>Percent Nonwhite Population, 1990</b>	<b>Percent Persons Below Poverty Level, 1989</b>
Franklin County	6.4	14.4
Moore County	3.9	6.5
Reservoir Census Tracts	6.6	13.0
Tennessee	17.0	15.7

Source: U. S. Census of Population, 1990

### **3.13.2 ENVIRONMENTAL CONSEQUENCES**

In the reservoir area, as well as in the two counties in which the reservoir is located, both the nonwhite population and the share of persons below poverty level is lower than the state average. None of the proposed land uses would displace residents or create disproportionate impacts on disadvantaged populations in the area. Any additional recreational opportunities created would be available to all on an equal basis; increased recreational activity is not expected to have significant impacts on nearby residents. Therefore, there are no disproportionate impacts on disadvantaged populations.

### **3.14 ECONOMIC BENEFITS AND COSTS**

Under any of the alternatives, there would likely be increases over time in the economic benefits accruing from Tims Ford Reservoir and the lands around the reservoir. One source of economic benefits would be increased property values and the resulting increases in local government revenues. Another would be increased local sales tax revenues. Increased sales from growth in tourism would increase income and employment, as well as sales tax revenues, in the Tims Ford area.

There are a number of intangible economic benefits associated with each of the alternatives. These include the value of the scenic beauty of the area in general, the view from specific residential and commercial sites, and the value of non-market recreational activities such as hiking, bird watching, and photography. Property values may be positively affected by proximity to parks, open space, greenways, and recreational trails as well as proximity to the reservoir.

Development would result in additional costs to local (and probably state) governments and could increase costs to area residents, recreational users, and other visitors to the area. Development inevitably leads to increased capital and maintenance costs for infrastructure, such as roads and water and waste water systems. Costs of public safety such as fire and police protection and emergency health services would likely increase. School costs would also be impacted if county populations increase as a result of development. These additional costs are not always offset by increases in local government revenues (see Horchem and Gottfried, 1998; Muller, 1975; Muller and Dawson, 1972; Schaenman and Muller, 1974). Less tangible costs include increased congestion and crowding, loss of informal recreational opportunities, and loss of open space and visual quality. Water quality may be threatened, resulting in increased costs to maintain an acceptable level of quality.

Additional residential development around the reservoir would increase the value of the affected property. However, much of this increase in population around the reservoir would consist of persons who would live elsewhere in the affected counties if property were not available around the reservoir. Therefore, the net financial impact on property values and on local tax revenues would be less than the increases that

would otherwise accrue if people from counties other than the affected counties were to purchase properties around the reservoir.

Development that resulted in losses in the quality of life in the area, such as scenic views, overall attractiveness, access to informal recreational opportunities, and the lack of congestion and crowding, would ultimately result in negative impacts on property values, even though short-term impacts might be positive.

Additionally, TVA pays tax equivalent payments to Franklin and Moore counties. Information regarding dollars paid directly to Moore and Franklin Counties in lieu of taxes plus dollars that were paid to the State which were redistributed to these counties for 1998 and 1999 is presented in the Table 3.14-1.

**Table 3.14-1 Tax Equivalent Payments**

	<b>Franklin County</b>	<b>Moore County</b>
1998 - \$ Paid Direct	\$10,215	\$2,190
1998 - \$ State Distribution	\$532,602	\$88,326
1999 - \$ Paid Direct	\$10,215	\$2,920
1999 - \$ State Distribution	\$595,992	\$99,529

#### **Alternative A**

Under Alternative A, plannable land would be considered for specific uses on a case-by-case basis. Existing uses, however, would likely continue. Existing residential areas without land rights for water access would likely be considered for residential access, affecting 122 acres and 17.1 miles of shoreline. The 881 acres of land containing sensitive resources would be maintained in a protective category, and about 1,958 acres deemed not suitable or capable for development could be managed for Natural Resource Conservation. Six acres are in existing light commercial use, and 279 acres have existing recreational uses. The remaining 2,821 acres could be considered for development for residential, recreational, and/or industrial or commercial uses.

Development of these lands would increase income and employment in the area, and would, at least initially, increase property values. However, development negatively impacting the intangible benefits of the area (such as general scenic beauty, specific views, informal recreational opportunities, and water quality) would ultimately begin to have negative impacts on property values as the area begins to be less desirable for residential and recreational use. Detrimental impacts on property values would also affect local government property tax revenues. Sales taxes would increase as long as population and recreational visitation continued to grow, but would also be negatively impacted if loss of attractiveness diminished the market for the reservoir and surrounding area. Costs to the local government would increase as more roads are needed and used more frequently, as water and waste water systems have to expand, as school systems have to expand, and as more tax revenues are required for public safety. Lack of overall planning would make it more difficult to control such impacts.

#### **Alternative B**

Alternative B calls for the creation of additional recreational opportunities, including activities that are not water based. As these opportunities are developed, property values would increase. These increases would occur directly as a result of increased demand for property for developmental purposes and also indirectly because the increase in recreational opportunities would make the area more desirable both to visitors and to potential residents of the area. This increase in property values would lead to an increase in property tax revenues to the local governments. In addition, the increased expenditures for goods and services on the part of tourists would increase sales tax revenues to the local governments.

These additional recreational opportunities also would create more job opportunities and additional income in the local area. Intangible benefits of the area also would be better maintained or even



enhanced with the availability of more informal recreational opportunities than likely would be the case under Alternative A. Views and general scenic beauty of the area would be better maintained and this type of development would be less detrimental to water quality than the more extensive development that would be likely under Alternative A. Also, this type of development is likely to be less detrimental in the long term to property values than under Alternative A.

Additional government outlays would be required for public services, as discussed above under Alternative A. However, additional costs for most public and community services would likely be less than under Alternative A.

#### **Alternative B1**

Alternative B1 is similar to Alternative B, but it has 117 fewer acres allocated to Zone 7 (Residential Development/Access) and 87 more to Zone 4 (Natural Resource Conservation). It also allocates some narrow shoreline strips to a new category, Zone 8 (Conservation Partnership), which is coupled with a new management strategy to establish a wider shoreline buffer zone in certain areas. As a result of this and other adjustments, including possible water access via community water-use facilities for property otherwise without water access, Alternative B1 most likely would result in slightly lower population along the reservoir but improved scenic and environmental characteristics. This improvement in views and the environment would have positive impacts on property values, leading to somewhat higher property values than under Alternative B. In turn, property tax revenues would probably be somewhat higher than under Alternative B. At the same time, intangible benefits (beauty, views, informal recreation opportunities, water quality) would be greater than under Alternative B.

#### **Alternative C**

Alternative C, Maximum Land Development, would involve the disposition of all uncommitted suitable and capable parcels for development (residential, commercial/industrial, and recreation). Almost one-third of the shoreline miles (64.0 miles) would be available for residential development. There would be more residential development under this alternative than under any of the other alternatives. Development of this land for residential uses would quickly increase property tax revenues to local governments. However, this type of development is likely to have detrimental impacts on scenic beauty and views and on water quality and would eliminate many opportunities for informal recreation. These impacts would, over time, diminish the attractiveness of the area and ultimately begin to have negative impacts on property values, income and employment in the area, recreational usage, and both property and sales tax revenues to local governments. This alternative also would likely result in greater cost increases for all public and community services than any of the other alternatives, except possibly Alternative A.

#### **Alternative D**

Alternative D would allocate all uncommitted lands for natural resource conservation. No new land development would be allowed, although existing uses would be allowed to continue. Because there would be no new development, property values and local government revenues from property and sales taxes would not be directly impacted. However, this alternative would maintain an attractive environment that would over the long term enhance the value of property in the area and that would make it a more desirable area in which to live. This enhanced attractiveness would have positive impacts on property values of lands adjacent to and nearby the undeveloped areas of the reservoir. By improving the attractiveness of the area, not only property values but also property tax and sales tax revenues would increase. Also, adoption of this alternative would likely result in smaller impacts on the need for public and community services than any of the other alternatives.

#### **Summary**

In the short term, adoption of Alternative C probably would have the greatest positive impact on income, property values, and local government revenues from property and sales taxes. Much of this gain, however, would be at the expense of the intangible benefits (scenic beauty, views, informal recreation opportunities, and water quality). Adoption of Alternative C would likely also result in the greatest increase in the total cost of public and community services, except possibly for Alternative A. Over the long term, Alternative B and B1 with their emphasis on a balance of development and resource protection would likely have the greatest positive economic impact because they would do a much better job of

protecting the overall attractiveness of the area and the area's intangible benefits while allowing development of some tracts of land. Also, the impacts from Alternatives B and B1 on the total cost of public and community services would likely be less than those under Alternatives A and C, and about the same or slightly less than under Alternative B, but more than under Alternative D. The impacts of Alternative A might be similar to those of Alternative C, although the lack of a plan would make this future much less certain. Adoption of Alternative D would have the most positive impacts on intangible benefits and the overall attractiveness of the area. However, the lack of development would mean reduced positive impacts on income, employment, property values, and local government tax revenues. At the same time, it would likely have the least impact on total cost of public and community services.

### **3.15 UNAVOIDABLE ADVERSE EFFECTS**

Disposition and commitment of the project lands and shoreline for residential access and commercial recreation is possible and/or proposed in four of the alternatives (A, B, B1, and C). These alternatives (A, B, B1, and C) would result in an increase in residential, recreational, and commercial shoreline development. The commercial development is light industrial, consisting of an existing office building complex and a staging area for assembling boat docks.

Additional development of project lands would result in losses of forested area, local impacts to wildlife habitat required by forest species, and increase suitable habitat for cowbirds. Suitable habitat for cowbirds would, in turn, impact the nesting success of other birds. Shoreline development also could result in a loss of potentially suitable, but presently unoccupied habitat for shoreline-using endangered and threatened species. The functions and values of wetlands could also be impacted by some shoreline development. Aquatic habitat suitability would decrease as more shoreline is opened for residential development. Residential development could also lead to nutrient enrichment of some reservoirs and fecal coliform contamination in some embayments.

From a recreational standpoint, residential shoreline development could essentially privatize public lands in front of reservoirfront houses, even though a strip of land adjacent to the shoreline would still be public. This unavoidably displaces informal recreational site users. Impacts associated with recreation are similar to residential, especially with developed cabin sites typically found around commercial marinas. Campgrounds can similarly impact habitat by removing understory vegetation. Lands allocated for development that would result in disposition (mainly residential) would no longer be available for public use. This would impact outdoor activities such as hiking, swimming, and hunting.

### **3.16 RELATIONSHIP OF SHORT-TERM USES AND LONG-TERM PRODUCTIVITY**

Disposition and commitment of the project lands and shoreline to residential access and commercial recreation is a long-term decision that would decrease the productivity of the land for forest, wildlife, recreational, agricultural, and natural area management. Long-term productivity decreases would be greatest for Alternative C. Alternative B and B1 would have some decreases and the extent of impacts for Alternative A are difficult to predict, as they would depend on the outcome of future case-by-case reviews. The types of changes that occur with residential development would result in a decline in the habitat quality for some terrestrial species and an increase in habitat for others. Many of the water-related impacts of shoreline development could be minimized by the use of appropriate controls on erosion, added nutrients, and pesticide input.

Increased development would occur under Alternatives A, B, B1, and C and result in population increases along the shoreline. New jobs and income would be generated by the spending activities of these new residents, leading to enhanced long-term socioeconomic productivity. This would be the case as long as the desirable features that prompted their move to the shoreline were maintained or enhanced.

### **3.17 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES**

Irretrievable use of nonrenewable resources (i.e., fuel, energy, and some construction materials) would occur under Alternatives A, B, B1, and C due to residential shoreline development. However, most of the new development would not result in a region-wide population increase. This means that the same development could occur somewhere else in the region. Therefore, most (if not all) of these resources could be used somewhere in the region to provide the same residential development services, regardless of the alternative chosen.

As shoreline is converted to residential use, the land would be essentially permanently changed and not available for agricultural, forestry, wildlife habitat, natural area, and recreational uses in the foreseeable future. This is an irreversible commitment of land which would be greater in magnitude under those alternatives that open larger amounts of shoreline to residential access and development.

### **3.18 ENERGY REQUIREMENTS AND CONSERVATION POTENTIAL**

#### **Project Operations**

Energy is used by machines for fuel to maintain grassy areas on the dam reservation and by the operation of the Hydro-electric plant located at Tims Ford Dam. There are no short-term energy uses required for the Dam Reservation, as it is already established.

#### **Sensitive Resource Protection**

Sensitive Resource Protection areas are allocated the same for all four alternatives. Some areas set aside for protection of archeological sites could potentially be maintained by mowing, light disking, or controlled burning. There would be some short-term energy use of fuel for machines to conduct these type of activities. The level of these activities is considered to be minimal.

#### **Natural Resource Conservation and Sensitive Resource Protection**

Energy is also used by machines to maintain areas set aside for natural resource conservation. Although these activities are not likely to have much influence on regional energy use demands, there would be some short-term energy use for fuel to conduct prescribed natural resource conservation activities such as mowing, timber management, controlled burning, disking, planting of small grain crops, etc. Adoption of Alternative D would have the largest demand for this type of energy use, as it has the largest amount of acreage allocated for Natural Resource Conservation.

#### **Industrial/Commercial Development**

In general, allocations made for this land-use category are for existing practices and/or land uses. Alternative A could include up to 67 acres with approximately 0.6 shoreline miles available for industrial or commercial development purposes. Alternatives B, B1, and C include 67 acres and approximately 1.8 shoreline miles for industrial or commercial development purposes. Alternative D includes 6 acres with approximately 0.6 shoreline miles available for development. No additional increases in energy usage would result from industrial or commercial development.

#### **Recreation**

Recreational activities that would require short-term and long-term energy would be marinas, campgrounds, public-use areas, and parks. Short-term energy would be from machines used to clear the land for and construct additional marinas and campgrounds under Alternatives A, B, B1, and C. Long-term energy would be required for the operation and maintenance of facilities and land. Types of activities would include, operation of facilities and fuel for machines to maintain vegetation. The largest increase in energy use would be from additional marinas and campgrounds under Alternatives B, B1, and C. Alternative D would only require long-term energy for maintenance of the existing recreation areas, such as public-use areas, state and local parks, and campgrounds.

**Residential Development**

Energy is required to build and maintain residential areas, as well as to manage vegetation around residences and the shoreline. Although shoreline development is not likely to have much influence on regional energy use trends, those alternatives that allow the most residential development would result in relatively greater short- and long-term energy usage. Short-term energy would be from machines used to clear the land for residential development, and long-term energy usage would be from energy to power the homes and from fuel used to maintain lawns. While part of the residential development would be for persons who would otherwise live elsewhere in the general area, other residences would be weekend/vacation homes for residents of larger surrounding cities such as Huntsville, Alabama. Additionally, developments that are well-designed and marketed regionally or nationally could attract some residents from other areas, particularly retirees. Alternative C would have the largest demand due to the largest allocation for residential development, followed by A, B1, and B. Alternative D would have very little effect in that it does not allocate any additional land for residential development.

The Shoreline Management Initiative EIS (TVA, 1999) determined that among the residents in general, certain energy end-uses would be more likely to be found in shoreline homes. These include water pumps, additional decorative and security lighting, boat lifts, and boat heaters. Estimated annual incremental electricity usage would range from 300 kWh to 700 kWh per home. Average incremental energy usage would probably be towards the lower end of the range. In addition to electricity usage, gasoline consumption could be higher for shoreline residents. Those who commute to work would potentially have to travel longer distances. Also, shoreline residents are likely to use more boat gasoline when compared to the average Franklin or Moore County resident.

Adoption of Alternative D would tend to conserve energy in that no new development would be allowed on the project lands. However, more land would be managed for natural resource conservation resulting in more fuel use for machines to conduct management activities mentioned earlier.

**3.19 PROPOSED MITIGATION MEASURES**

The following proposed mitigation measures would be considered in preparing the Record of Decision (ROD):

New residential development would be required to have groundwater protection plans submitted by the developer to TDEC for approval prior to development.

Throughout the construction phase of new subdivisions, periodic site visits to check for potential erosion problems and the use of BMPs would be needed.

Fringe wetlands would be avoided during any future development and/or permitting activities.

Parcels containing uncommon terrestrial habitats or plants would be protected by avoidance during any future developmental activities. Sale deeds related to disposition would include conditions that would require avoidance of the resource on the parcel.

Livestock grazing on TVA property will be phased out as alternative water sources and pasture are obtained.

An environmental site review will be required during the Section 26a process for requests for facilities within the Zone 8 (Conservation Partnership) parcels.